Table 4.6 Year 2035 Employment and Population

Percentage Change from No-Project

County	Employment				Population			
	2002 Existing	2035			2002 Existing	2035		
		No-Project	Modal	HST Base		No-Project	Modal	HST Base
Alameda	n/a	0.0%	0.7%	1.1%	n/a	0.0%	0.6%	1.1%
Contra Costa	n/a	0.0%	0.7%	1.3%	n/a	0.0%	0.6%	1.2%
San Francisco	n/a	0.0%	0.9%	2.3%	n/a	0.0%	1.6%	4.7%
San Mateo	n/a	0.0%	0.8%	2.5%	n/a	0.0%	0.8%	2.6%
Santa Clara	n/a	0.0%	0.8%	1.7%	n/a	0.0%	0.7%	1.9%
Solano	n/a	0.0%	0.8%	1.8%	n/a	0.0%	0.5%	1.1%
Bay Area*	n/a	0.0%	0.8%	1.7%	n/a	0.0%	0.7%	1.9%
Madera	n/a	0.0%	0.5%	1.0%	n/a	0.0%	0.3%	0.9%
Merced	n/a	0.0%	1.3%	6.0%	n/a	0.0%	0.6%	6.7%
Sacramento	n/a	0.0%	1.0%	4.7%	n/a	0.0%	0.8%	3.0%
San Joaquin	n/a	0.0%	2.2%	3.1%	n/a	0.0%	1.1%	1.0%
Stanislaus	n/a	0.0%	1.3%	3.8%	n/a	0.0%	0.7%	1.5%
Yolo	n/a	0.0%	0.4%	1.9%	n/a	0.0%	0.3%	1.4%
North Central Valley*	n/a	0.0%	1.3%	4.3%	n/a	0.0%	0.8%	2.4%
Fresno	n/a	0.0%	1.5%	3.1%	n/a	0.0%	0.9%	2.1%
Kern	n/a	0.0%	0.6%	1.1%	n/a	0.0%	0.4%	0.8%
Kings	n/a	0.0%	0.8%	1.3%	n/a	0.0%	0.2%	0.4%
Tulare	n/a	0.0%	0.3%	0.4%	n/a	0.0%	0.1%	0.2%
South Central Valley*	n/a	0.0%	1.0%	1.9%	n/a	0.0%	0.5%	1.1%
Los Angeles	n/a	0.0%	1.0%	1.3%	n/a	0.0%	0.8%	1.1%
Orange	n/a	0.0%	1.3%	1.1%	n/a	0.0%	1.3%	1.0%
Riverside	n/a	0.0%	0.9%	0.1%	n/a	0.0%	0.4%	-0.4%
San Bernardino	n/a	0.0%	0.7%	2.1%	n/a	0.0%	0.4%	1.8%
San Diego	n/a	0.0%	1.5%	1.9%	n/a	0.0%	1.3%	1.7%
Southern California*	n/a	0.0%	1.1%	1.3%	n/a	0.0%	0.9%	1.1%
Rest of State	n/a	0.0%	-0.5%	0.2%	n/a	0.0%	-0.1%	0.6%
Statewide Total	**n/a**	**0.0%**	**0.8%**	**1.5%**	**n/a**	**0.0%**	**0.7%**	**1.3%**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "Rest of State" grouping.

4.1.1 No-Project Alternative

On a statewide basis, population is projected to increase from year 2002 levels by about 9.6 million in 2020 and 19.4 million in 2035. These increases represent growth rates of 27 percent between now and 2020 and by 54 percent between now and 2035. The long-term growth rate averages to about 1.4 percent annually, which is slightly less than California's 1.8 percent annual population growth rate since 1970, but consistent with long-term population forecasts by the California Department of Finance and the U.S. Census Bureau.

Employment growth rates are somewhat similar, with jobs increasing by 34 percent (6.6 million) between now and 2020, and by 46 percent (9.1 million) between now and 2035. The long-term growth rate averages about 1.3 percent per year, which is one-half of the 2.6 percent annual employment growth rate since 1970. Employment growth is projected to be more robust than population growth between now and 2020, with this situation reversing beyond 2020. This "front-loading" of employment, which was common to all alternatives, was influenced by the use of industry-specific growth factors that were inferred from Caltrans' employment forecasts (see Section 3.2.1).[2]

4.1.2 HST Alternative

Statewide population and employment forecasts for the HST Alternative are very similar to the No-Project Alternative. For year 2020, the HST Alternative is projected to add about 170,000 more people and 240,000 more jobs than the No-Project Alternative. These 2020 values represent relative increases of 0.4 percent for population and 0.9 percent for employment over the No-Project forecasts. For year 2035, the HST Alternative is projected to add about 700,000 more people and 450,000 more jobs than the No-Project Alternative. These 2035 values represent relative increases of 1.3 to 1.5 percent for over the No-Project forecasts.

These forecasts suggest that the incremental population effect (i.e., increase in population relative to the No-Project Alternative) is slower to develop than the incremental employment. Specifically, about 25 percent of the population effect occurs by 2020, while about 50 percent of the employment effect occurs in the same timeframe. These results are consistent with economic theory that suggests that the direct employment effects from a major stimulative action (i.e., a new HST system) will occur shortly after the stimulative action is taken. Since the HST Alternative is assumed to open between 2016 and 2019, a significant amount of the total employment effect would occur by 2020. On the other hand, population growth tends to lag the direct employment effect for two key reasons:

[2] This methodology did not change the overall employment growth projected between 2002 and 2035, but rather redistributed the timing of that growth with more occurring in the 2002 to 2020 timeframe than would have been forecast through direct use of the Woods and Poole data.

- Jobs generated by the direct employment effect tend to be filled through the existing labor pool rather than through migration; and

- Population increases tend to be driven more by growth in indirect and induced employment, both of which tend to be spread out in time.

4.1.3 Modal Alternative

Statewide population and employment forecasts for the Modal Alternative are very similar to the No-Project Alternative. For year 2020, the Modal Alternative is projected to add about 85,000 more people and 135,000 more jobs than the No-Project Alternative. These 2020 values represent relative increases of 0.2 percent for population and 0.5 percent for employment over the No-Project forecasts. For year 2035, the Modal Alternative is projected to add about 360,000 more people and 250,000 more jobs than the No-Project Alternative. These 2035 values represent relative increases of 0.7 to 0.8 percent for over the No-Project forecasts.

Statewide results for the Modal and HST Alternatives are also similar, although the Modal Alternative is projected to generate about 200,000 (0.7 percent) fewer jobs and about 330,000 (0.6 percent) fewer residents than the HST Alternative in 2035. These slightly more modest growth effects for the Modal Alternative can be linked to the need for increased gas taxes, user fees, and other funding that would be needed to pay for the additional cost of the Modal Alternative relative to the HST Alternative.

4.2 HST Design Options

The analysis included five design options (in addition to the base HST Alternatives) that represent variations in HST alignment and/or station location. Specific features of the design options were described in Section 2.2.3. Population and employment forecasts were generated for each HST design option, and results are presented in Tables 4.7 and 4.8 for the 2020 and 2035 analysis years, respectively. Population and employment growth rates for each design option, relative to the No-Project Alternative, are presented in Tables 4.9 and 4.10. As with results for the system alternatives, all tables summarize results by primary analysis county, REMI region, and statewide.

Each design option resulted in slight differences in population and employment growth at the county, regional, and statewide levels. At the statewide level, the results for all design options fall in a very narrow range compared to the base HST Alternative. There is a range of about 17,000 jobs and 29,000 people in 2035, both of which represent difference of less than 0.06 percent from the 2035 base forecasts. Similarly, all HST design options exhibit similar levels of population and employment for all counties and regions, and there are no meaningful differences in these results to distinguish between the design options.

Table 4.7 Year 2020 Employment and Population for HST Design Options

County and Regional Totals

County	Employment					Population				
		HST Design Options					HST Design Options			
	HST (base)	Palmdale	Diablo Direct	East Bay	Irvine	HST (base)	Palmdale	Diablo Direct	East Bay	Irvine
Alameda	1,220,964	1,220,473	1,221,133	1,221,329	1,221,074	1,800,288	1,799,929	1,800,588	1,800,288	1,800,097
Contra Costa	694,884	694,577	694,848	694,884	694,959	1,109,296	1,109,064	1,109,214	1,109,296	1,109,149
San Francisco	882,165	881,642	882,201	881,945	882,020	758,621	758,328	758,803	758,621	758,381
San Mateo	620,905	620,561	620,822	620,688	620,655	861,905	861,679	861,866	861,905	861,621
Santa Clara	1,694,441	1,693,721	1,693,472	1,694,512	1,694,308	2,212,919	2,212,386	2,212,306	2,212,919	2,212,411
Solano	245,738	245,612	245,734	245,738	245,750	554,460	554,363	554,462	554,460	554,380
Bay Area*	5,359,096	5,356,586	5,358,210	5,359,096	5,358,766	7,297,489	7,295,749	7,297,239	7,297,489	7,296,039
Madera	96,816	96,810	96,897	96,816	96,826	224,926	224,919	224,953	224,926	224,928
Merced	119,085	118,999	119,150	119,085	119,071	333,092	333,053	333,127	333,092	333,077
Sacramento	1,008,258	1,007,947	1,008,473	1,008,258	1,008,543	1,653,432	1,653,099	1,653,592	1,653,432	1,653,434
San Joaquin	418,184	418,748	418,264	418,184	418,130	885,126	885,302	885,192	885,126	885,106
Stanislaus	307,929	307,862	307,874	307,929	307,882	711,687	711,643	711,699	711,687	711,667
Yolo	152,155	152,131	152,164	152,155	152,178	225,644	225,621	225,653	225,644	225,645
North Central Valley*	2,102,426	2,102,497	2,102,823	2,102,426	2,102,630	4,033,906	4,033,636	4,034,216	4,033,906	4,033,856
Fresno	613,863	613,678	613,770	613,863	613,751	1,122,171	1,122,080	1,122,162	1,122,171	1,121,873
Kern	456,151	456,199	456,217	456,151	456,135	1,076,218	1,076,202	1,076,225	1,076,218	1,075,901
Kings	67,222	67,212	67,212	67,222	67,213	187,042	187,042	187,043	187,042	187,015
Tulare	224,832	224,660	224,826	224,832	224,822	570,327	570,205	570,328	570,327	570,299
South Central Valley*	1,362,068	1,361,750	1,362,025	1,362,068	1,361,921	2,955,758	2,955,528	2,955,758	2,955,758	2,955,088
Los Angeles	6,754,661	6,752,225	6,754,020	6,754,661	6,752,899	11,615,933	11,614,513	11,615,788	11,615,933	11,614,152
Orange	2,673,920	2,673,026	2,673,650	2,673,920	2,676,717	3,438,194	3,437,742	3,438,112	3,438,194	3,438,673
Riverside	1,075,097	1,074,783	1,075,031	1,075,097	1,074,894	2,748,494	2,748,277	2,748,443	2,748,494	2,748,284
San Bernardino	1,144,253	1,143,965	1,144,185	1,144,253	1,144,076	2,786,344	2,786,157	2,786,301	2,786,344	2,786,179
San Diego	2,638,258	2,637,220	2,637,851	2,638,258	2,637,334	3,935,842	3,935,238	3,935,722	3,935,842	3,935,129
Southern California*	14,286,189	14,281,220	14,284,738	14,286,189	14,285,919	24,524,807	24,521,927	24,524,367	24,524,807	24,522,417
Rest of State	3,566,922	3,566,248	3,566,536	3,566,922	3,566,915	6,806,197	6,805,367	6,805,837	6,806,197	6,805,437
Statewide Total	**26,676,703**	**26,668,301**	**26,674,331**	**26,676,703**	**26,676,152**	**45,618,157**	**45,612,207**	**45,617,417**	**45,618,157**	**45,612,837**

Source: Cambridge Systematics, Inc., 2003.

*Only includes counties within a region that have a high-speed rail station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "Rest of State" grouping.

Table 4.8 Year 2035 Employment and Population for HST Design Options

County and Regional Totals

County	Employment					Population				
		HST Design Options					HST Design Options			
	HST (base)	Palmdale	Diablo Direct	East Bay	Irvine	HST (base)	Palmdale	Diablo Direct	East Bay	Irvine
Alameda	1,287,498	1,286,805	1,287,762	1,287,863	1,287,842	2,027,153	2,026,093	2,027,557	2,027,153	2,027,737
Contra Costa	732,194	731,774	732,172	732,194	732,498	1,242,398	1,241,684	1,242,383	1,242,398	1,242,858
San Francisco	939,928	939,076	940,022	939,709	940,028	738,467	737,304	738,788	738,467	738,870
San Mateo	652,637	652,073	652,520	652,421	652,477	954,896	954,141	954,915	954,896	954,851
Santa Clara	1,816,613	1,815,482	1,815,223	1,816,684	1,816,784	2,546,153	2,544,626	2,544,594	2,546,153	2,546,789
Solano	256,421	256,249	256,433	256,421	256,519	669,301	669,021	669,332	669,301	669,465
Bay Area*	5,685,292	5,681,459	5,684,131	5,685,292	5,686,149	8,178,369	8,172,869	8,177,569	8,178,369	8,180,569
Madera	151,305	151,314	151,534	151,305	151,354	315,340	315,282	315,496	315,340	315,338
Merced	174,870	174,629	175,016	174,870	174,810	449,329	449,188	449,523	449,329	449,320
Sacramento	1,097,473	1,097,099	1,098,163	1,097,473	1,098,376	2,061,967	2,060,397	2,062,379	2,061,967	2,062,826
San Joaquin	518,037	519,361	518,134	518,037	517,793	1,164,907	1,166,299	1,165,231	1,164,907	1,164,910
Stanislaus	397,966	397,725	397,744	397,966	397,770	934,388	934,383	934,398	934,388	934,378
Yolo	178,343	178,311	178,374	178,343	178,410	282,497	282,379	282,501	282,497	282,555
North Central Valley*	2,517,994	2,518,438	2,518,965	2,517,994	2,518,513	5,208,428	5,207,928	5,209,528	5,208,428	5,209,328
Fresno	709,524	709,107	709,302	709,524	709,404	1,441,577	1,441,061	1,441,522	1,441,577	1,441,460
Kern	528,661	528,814	528,865	528,661	528,834	1,479,979	1,479,821	1,479,966	1,479,979	1,479,645
Kings	75,945	75,910	75,908	75,945	75,909	245,137	245,140	245,143	245,137	245,140
Tulare	249,205	248,909	249,191	249,205	249,188	763,163	762,916	763,166	763,163	763,152
South Central Valley*	1,563,334	1,562,740	1,563,266	1,563,334	1,563,335	3,929,857	3,928,937	3,929,797	3,929,857	3,929,397
Los Angeles	7,502,773	7,498,839	7,502,027	7,502,773	7,500,791	13,454,864	13,449,631	13,454,360	13,454,864	13,452,121
Orange	2,901,398	2,899,938	2,900,964	2,901,398	2,906,817	3,950,770	3,948,597	3,950,363	3,950,770	3,959,365
Riverside	1,163,500	1,163,021	1,163,441	1,163,500	1,163,312	3,965,826	3,964,904	3,965,673	3,965,826	3,965,424
San Bernardino	1,245,657	1,245,192	1,245,565	1,245,657	1,245,466	3,867,414	3,866,590	3,867,261	3,867,414	3,867,070
San Diego	2,921,375	2,919,464	2,920,604	2,921,375	2,919,824	4,870,658	4,868,110	4,870,175	4,870,658	4,868,852
Southern California*	15,734,703	15,726,454	15,732,601	15,734,703	15,736,209	30,109,532	30,097,832	30,107,832	30,109,532	30,112,832
Rest of State	3,815,877	3,814,498	3,815,180	3,815,877	3,816,350	8,475,119	8,472,039	8,473,939	8,475,119	8,475,889
Statewide Total	**29,317,201**	**29,303,589**	**29,314,144**	**29,317,201**	**29,320,556**	**55,901,305**	**55,879,605**	**55,898,665**	**55,901,305**	**55,908,015**

Source: Cambridge Systematics, Inc., 2003.

*Only includes counties within a region that have a high-speed rail station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "Rest of State" grouping.

Table 4.9 Year 2020 Employment and Population for HST Design Options

Percentage Change from No-Project

County	Employment					Population				
	HST (base)	HST Design Options				HST (base)	HST Design Options			
		Palmdale	Diablo Direct	East Bay	Irvine		Palmdale	Diablo Direct	East Bay	Irvine
Alameda	0.7%	0.7%	0.7%	0.7%	0.7%	0.4%	0.4%	0.4%	0.4%	0.4%
Contra Costa	0.8%	0.8%	0.8%	0.8%	0.8%	0.4%	0.4%	0.4%	0.4%	0.4%
San Francisco	1.5%	1.5%	1.5%	1.5%	1.5%	1.0%	1.0%	1.1%	1.0%	1.0%
San Mateo	1.6%	1.6%	1.6%	1.6%	1.6%	0.7%	0.7%	0.7%	0.7%	0.7%
Santa Clara	1.1%	1.1%	1.1%	1.1%	1.1%	0.7%	0.7%	0.7%	0.7%	0.7%
Solano	1.1%	1.1%	1.1%	1.1%	1.1%	0.4%	0.4%	0.4%	0.4%	0.4%
Bay Area*	1.1%	1.1%	1.1%	1.1%	1.1%	0.6%	0.6%	0.6%	0.6%	0.6%
Madera	0.8%	0.7%	0.8%	0.8%	0.8%	0.2%	0.2%	0.2%	0.2%	0.2%
Merced	4.1%	4.0%	4.1%	4.1%	4.1%	4.2%	4.1%	4.2%	4.2%	4.2%
Sacramento	2.4%	2.4%	2.5%	2.4%	2.5%	0.1%	0.1%	0.1%	0.1%	0.1%
San Joaquin	1.5%	1.6%	1.5%	1.5%	1.5%	0.1%	0.1%	0.1%	0.1%	0.1%
Stanislaus	2.0%	2.0%	2.0%	2.0%	2.0%	0.4%	0.4%	0.4%	0.4%	0.4%
Yolo	0.9%	0.9%	0.9%	0.9%	0.9%	0.1%	0.1%	0.1%	0.1%	0.1%
North Central Valley*	2.1%	2.1%	2.1%	2.1%	2.1%	0.5%	0.5%	0.5%	0.5%	0.5%
Fresno	1.8%	1.8%	1.8%	1.8%	1.8%	0.7%	0.7%	0.7%	0.7%	0.7%
Kern	0.6%	0.7%	0.7%	0.6%	0.6%	0.2%	0.2%	0.2%	0.2%	0.2%
Kings	0.9%	0.9%	0.9%	0.9%	0.9%	0.2%	0.2%	0.2%	0.2%	0.2%
Tulare	0.3%	0.2%	0.2%	0.3%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%
South Central Valley*	1.1%	1.1%	1.1%	1.1%	1.1%	0.4%	0.4%	0.4%	0.4%	0.4%
Los Angeles	0.8%	0.8%	0.8%	0.8%	0.8%	0.3%	0.3%	0.3%	0.3%	0.3%
Orange	0.7%	0.6%	0.7%	0.7%	0.8%	0.2%	0.2%	0.2%	0.2%	0.2%
Riverside	-0.1%	-0.2%	-0.2%	-0.1%	-0.2%	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%
San Bernardino	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%
San Diego	1.2%	1.2%	1.2%	1.2%	1.2%	0.5%	0.5%	0.5%	0.5%	0.5%
Southern California*	0.8%	0.8%	0.8%	0.8%	0.8%	0.3%	0.3%	0.3%	0.3%	0.3%
Rest of State	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%
Statewide Total	**0.9%**	**0.9%**	**0.9%**	**0.9%**	**0.9%**	**0.4%**	**0.4%**	**0.4%**	**0.4%**	**0.4%**

Source: Cambridge Systematics, Inc., 2003.

*Only includes counties within a region that have a high-speed rail station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "Rest of State" grouping.

Table 4.10 Year 2035 Employment and Population for HST Design Options

Percentage Change from No-Project

County	Employment					Population				
		HST Design Options					HST Design Options			
	HST (base)	Palmdale	Diablo Direct	East Bay	Irvine	HST (base)	Palmdale	Diablo Direct	East Bay	Irvine
Alameda	1.1%	1.0%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
Contra Costa	1.3%	1.2%	1.3%	1.3%	1.3%	1.2%	1.2%	1.2%	1.2%	1.3%
San Francisco	2.3%	2.3%	2.4%	2.3%	2.4%	4.7%	4.5%	4.7%	4.7%	4.7%
San Mateo	2.5%	2.4%	2.5%	2.5%	2.5%	2.6%	2.5%	2.6%	2.6%	2.6%
Santa Clara	1.7%	1.7%	1.7%	1.7%	1.8%	1.9%	1.8%	1.8%	1.9%	1.9%
Solano	1.8%	1.8%	1.8%	1.8%	1.9%	1.1%	1.1%	1.1%	1.1%	1.2%
Bay Area*	1.7%	1.7%	1.7%	1.7%	1.7%	1.9%	1.8%	1.9%	1.9%	1.9%
Madera	1.0%	1.0%	1.2%	1.0%	1.1%	0.9%	0.8%	0.9%	0.9%	0.9%
Merced	6.0%	5.9%	6.1%	6.0%	6.0%	6.7%	6.7%	6.7%	6.7%	6.7%
Sacramento	5.7%	5.7%	5.8%	5.7%	5.8%	3.0%	2.9%	3.0%	3.0%	3.0%
San Joaquin	3.1%	3.3%	3.1%	3.1%	3.0%	1.0%	1.1%	1.0%	1.0%	1.0%
Stanislaus	3.8%	3.8%	3.8%	3.8%	3.8%	1.5%	1.5%	1.5%	1.5%	1.5%
Yolo	1.9%	1.9%	2.0%	1.9%	2.0%	1.4%	1.3%	1.4%	1.4%	1.4%
North Central Valley*	4.3%	4.4%	4.4%	4.3%	4.4%	2.4%	2.3%	2.4%	2.4%	2.4%
Fresno	3.1%	3.0%	3.1%	3.1%	3.1%	2.1%	2.1%	2.1%	2.1%	2.1%
Kern	1.1%	1.1%	1.1%	1.1%	1.1%	0.8%	0.7%	0.8%	0.8%	0.7%
Kings	1.3%	1.3%	1.3%	1.3%	1.3%	0.4%	0.4%	0.4%	0.4%	0.4%
Tulare	0.4%	0.3%	0.4%	0.4%	0.4%	0.2%	0.1%	0.2%	0.2%	0.2%
South Central Valley*	1.9%	1.9%	1.9%	1.9%	1.9%	1.1%	1.1%	1.1%	1.1%	1.1%
Los Angeles	1.3%	1.2%	1.3%	1.3%	1.3%	1.1%	1.1%	1.1%	1.1%	1.1%
Orange	1.1%	1.0%	1.1%	1.1%	1.3%	1.0%	1.0%	1.0%	1.0%	1.3%
Riverside	0.1%	0.1%	0.1%	0.1%	0.1%	-0.4%	-0.5%	-0.4%	-0.4%	-0.4%
San Bernardino	2.1%	2.0%	2.1%	2.1%	2.0%	1.8%	1.8%	1.8%	1.8%	1.8%
San Diego	1.9%	1.8%	1.9%	1.9%	1.8%	1.7%	1.6%	1.7%	1.7%	1.6%
Southern California*	1.3%	1.3%	1.3%	1.3%	1.3%	1.1%	1.1%	1.1%	1.1%	1.1%
Rest of State	0.2%	0.1%	0.1%	0.2%	0.2%	0.6%	0.6%	0.6%	0.6%	0.7%
Statewide Total	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.3%**	**1.2%**	**1.2%**	**1.3%**	**1.3%**

Source: Cambridge Systematics, Inc., 2003.

*Only includes counties within a region that have a high-speed rail station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "Rest of State" grouping.

4.2.1 Palmdale Design Option

The Palmdale design option includes an additional station at Palmdale in the Antelope Valley of Los Angeles County. This somewhat slower alignment between Los Angeles and Bakersfield increases travel times between Southern California and the Central Valley and Bay Area regions. The longer travel times translate into slightly reduced ridership and travel efficiency benefits compared to the base HST Alternative. Taken together, these differences lead to a statewide reduction of 14,000 jobs and 22,000 people compared to the base HST Alternative in 2035. Nearly 60 percent of this reduction is expected to occur in the Southern California region, while most of the rest is expected to occur in the Bay Area.

4.2.2 Diablo Direct Design Option

The Diablo Direct design option reduces travel time between the Central Valley, Sacramento, and the Bay Area by eliminating stops at Los Banos (Merced County) and Gilroy (Santa Clara County), and following a more northerly alignment through the Diablo Range. This design option reduces statewide employment and population by about 3,000 each relative to the base HST Alternative in 2035.

Although this design option represents a faster connection between the Bay Area and Northern Central Valley, this improved travel time does not translate into higher population and employment growth in the affected counties as might be expected. One reason for this result is the elimination of stations at Los Banos and Gilroy, with associated loss of nearby HST access for Monterrey and San Benito Counties (at Gilroy). A second reason is that the base HST Alternative represents a large improvement in accessibility and travel efficiency for these counties over the other system alternatives, with the Diablo Direct design option providing a very marginal additional benefit *in terms of growth inducement potential*. Therefore, the growth effects for these counties manifest primarily in the base HST Alternative rather than this design option.

4.2.3 East Bay Design Option

The East Bay design option adds three stations between Oakland and San Jose on a branch line through Alameda County; this branch line was assumed to operate in addition to the base HST alignment between San Jose and San Francisco. This design option has no population or employment differences relative to the base HST Alternative at the statewide level, or for the Southern California or two Central Valley regions.

The lack of systemwide growth effects for this design option is tied to the alignment and operational similarities between the design option and base HST Alternative. Although this design option does introduce a new alignment in the East Bay, the relatively good transit and auto connections at all of the HST stations along the Peninsula and in the East Bay creates an offsetting effect in terms of station access and egress. Thus, there would

not be any appreciable differences in intercity travel times or demand between the design option and base HST Alternative for any of the Bay Area counties. Given these similarities, the growth analysis assumed that there would be no differences in regional totals for business attraction or business expansion.

Although there are no growth differences on a regional or systemwide level, some intraregional differences do exist within the Bay Area. The difference for this design option occurs through a slight shift of population and employment from San Francisco and San Mateo Counties to Alameda and Santa Clara Counties, with this shift driven by the following influences:

- The base HST Alternative provides a superior level of local accessibility for San Mateo and San Francisco counties. By shifting half of the HST service to the East Bay, some of this accessibility benefit will transfer to Alameda and northeastern Santa Clara Counties.

- Under the base HST Alternative, travelers to/from Contra Costa, Solano, Napa, and Alameda Counties would travel to stations in San Francisco or San Mateo Counties in order to ride HST. Under this design option, travelers to/from these four counties would be more likely to use an East Bay station thereby increasing the level of activity in the East Bay.

- Improved HST service to the East Bay would enhance direct commute access to the Fremont area and Downtown Oakland. Since the HST commute numbers for the base condition did not show any commute trips to Alameda County, any increase in HST commute trips to/from Alameda County would provide a shifting of benefits from San Mateo and San Francisco Counties to Alameda County.

4.2.5 Irvine Design Option

The Irvine design option, relative to the base HST Alternative, is projected to add about 3,300 jobs and 7,700 people on a statewide basis in 2035. This is the only design option that increases population an employment relative to the base HST Alternative. About one-half of this increase will occur in the Southern California region, with the remainder split among the Bay Area and northern Central Valley. Within the Southern California region, Orange County is projected to add about 5,500 jobs and 9,000 people while the other counties are projected to experience slight decreases in population and employment relative to the base HST Alternative.

4.2.6 Outlying Stations Design Option

The Outlying Stations design option was assumed to have identical transportation demand and service levels, and hence travel efficiency benefits, as the base HST Alternative. Given the influence of these characteristics on business attraction and expansion combined with the influence of simply having a HST station in a community

(irrespective of where it is located), this design option was assumed to have identical population and employment projections as the base HST Alternative for all counties.

4.3 Regional and County Growth Effects

Each of the system alternatives has varied effects on different parts of the State. Part of this difference is in terms of overall population and growth projections for the two analysis years; these results were displayed previously in Tables 4.1 through 4.10. Another part of the difference is related to the type of industries that are projected to experience employment growth under each system alternative. Tables 4.11 and 4.12 display industry-specific employment forecasts for 2020 and 2035, respectively, for 2002 existing conditions and the three system alternatives. Data in the tables are summarized by REMI analysis region, while Appendix I present county-level results. Table 4.13 presents the allocation of year 2020 incremental employment growth[3] by industry group for the Modal and HST Alternatives; Table 4.14 repeats this display with year 2035 results. Essentially, Tables 4.13 and 4.14 provide a picture of the types of jobs that would be generated by an investment in either the Modal or HST Alternative.

4.3.1 San Francisco Bay Area

Under the No-Project Alternative, the Bay Area region is projected to add about 1.2 million jobs and 980,000 people between now and 2020, and a further 500,000 jobs and 800,000 people between 2020 and 2035. The 2035 totals represent a relative employment increase of 28 percent from the current 6.3 million residents, and employment increase of 36 percent from the current 4.1 million jobs. Santa Clara County is projected to add the most population (670,000) and employment (500,000) from current levels. However, growth rates will be higher in Solano County, with increases of over 50 percent between now and 2035 for both population and employment. The employment growth rate exceeds the population growth rate for all counties in 2020; this result repeats in 2035 except for Solano County. San Francisco County is projected to experience a decrease in population together with an employment increase for all three system alternatives in both analysis years.

[3] Incremental employment growth refers to employment that is generated by the Modal or HST Alternative above and beyond the employment projected for the No-Project Alternative.

Table 4.11 Comparison of Employment by Industry Grouping for REMI Regions

Year 2020

REMI Region		Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Bay Area	2002 Existing	56,369	5,498	207,381	466,939	212,668	201,277	588,730	357,709	1,573,671	432,262	4,102,504
	2020 No-Project	56,363	6,626	235,396	493,692	246,851	242,069	702,980	419,349	2,382,103	514,509	5,299,940
	2020 Modal	56,363	6,668	237,154	496,215	251,389	243,376	706,903	421,022	2,392,333	515,156	5,326,580
	2020 HST	56,363	6,726	239,630	499,220	254,533	244,857	711,591	423,318	2,405,890	516,967	5,359,096
North Central Valley	2002 Existing	113,890	1,102	82,602	115,567	65,944	58,005	230,680	118,311	423,612	294,634	1,504,347
	2020 No-Project	112,345	1,344	94,630	133,175	91,498	85,707	340,469	152,638	657,640	390,020	2,059,465
	2020 Modal	112,345	1,355	95,476	134,169	92,502	86,245	342,696	153,691	661,885	390,439	2,070,801
	2020 HST	112,345	1,377	97,276	135,412	93,107	87,227	346,976	159,122	678,008	391,576	2,102,426
South Central Valley	2002 Existing	198,871	10,300	48,168	58,378	38,514	33,694	141,962	57,590	230,962	166,430	984,869
	2020 No-Project	207,493	11,693	61,172	69,981	51,568	44,442	186,011	73,312	363,555	277,659	1,346,886
	2020 Modal	207,493	11,740	61,646	70,833	51,864	44,798	187,419	73,886	366,848	278,065	1,354,590
	2020 HST	207,493	11,787	62,134	71,221	52,122	45,111	188,644	74,673	370,192	278,693	1,362,068
Southern California	2002 Existing	181,529	13,872	509,896	1,189,393	486,846	565,802	1,557,347	890,477	3,798,612	1,280,179	10,473,953
	2020 No-Project	176,724	15,514	596,328	1,373,284	643,361	776,961	2,196,723	1,081,013	5,654,345	1,653,001	14,167,255
	2020 Modal	176,724	15,723	603,703	1,384,790	651,929	783,838	2,216,187	1,086,620	5,692,978	1,656,297	14,268,790
	2020 HST	176,724	15,753	604,631	1,386,886	653,701	784,515	2,218,164	1,088,307	5,699,781	1,657,727	14,286,189
Rest of State	2002 Existing	246,365	6,096	171,131	215,459	88,512	136,204	406,082	214,575	861,643	376,152	2,722,219
	2020 No-Project	272,980	6,981	195,990	282,755	102,170	181,719	541,780	274,766	1,185,402	519,379	3,563,921
	2020 Modal	272,980	7,001	195,070	280,998	101,574	179,925	540,023	274,400	1,181,648	519,131	3,552,751
	2020 HST	272,980	7,044	196,878	283,275	102,233	180,770	543,527	274,566	1,185,239	520,499	3,567,011
Statewide Total	2002 Existing	797,024	36,868	1,019,178	2,045,736	892,484	994,982	2,924,801	1,638,662	6,888,500	2,549,657	19,787,892
	2020 No-Project	825,903	42,158	1,183,516	2,352,887	1,135,448	1,330,899	3,967,963	2,001,078	10,243,046	3,354,568	26,437,467
	2020 Modal	825,903	42,487	1,193,049	2,367,005	1,149,258	1,338,183	3,993,228	2,009,618	10,295,693	3,359,088	26,573,512
	2020 HST	825,903	42,686	1,200,550	2,376,014	1,155,696	1,342,480	4,008,902	2,019,986	10,339,111	3,365,463	26,676,791

Source: Cambridge Systematics, Inc., 2003.

Table 4.12 Comparison of Employment by Industry Grouping for REMI Regions

Year 2035

REMI Region		Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Bay Area	2002 Existing	56,369	5,498	207,381	466,939	212,668	201,277	588,730	357,709	1,573,671	432,262	4,102,504
	2035 No-Project	48,474	6,152	218,584	553,141	243,195	225,460	654,746	400,484	2,669,485	569,298	5,589,020
	2035 Modal	48,474	6,201	220,597	557,672	250,519	227,276	660,196	403,123	2,685,740	572,225	5,632,024
	2035 HST	48,474	6,265	223,300	563,504	256,105	229,280	666,547	406,844	2,707,573	577,399	5,685,292
North Central Valley	2002 Existing	113,890	1,102	82,602	115,567	65,944	58,005	230,680	118,311	423,612	294,634	1,504,347
	2035 No-Project	410,635	1,288	90,708	154,403	89,307	84,102	334,091	160,509	789,193	299,209	2,413,446
	2035 Modal	410,635	1,311	92,441	157,006	91,867	85,414	339,514	163,249	799,822	302,633	2,443,892
	2035 HST	410,635	1,338	94,835	159,696	92,814	87,158	347,108	177,443	838,763	308,203	2,517,994
South Central Valley	2002 Existing	198,871	10,300	48,168	58,378	38,514	33,694	141,962	57,590	230,962	166,430	984,869
	2035 No-Project	178,455	14,818	77,519	92,747	52,687	46,376	194,106	77,829	475,825	323,805	1,534,168
	2035 Modal	178,455	14,910	78,393	94,397	53,184	46,956	196,404	78,849	481,982	325,615	1,549,145
	2035 HST	178,455	14,984	79,172	95,294	53,632	47,431	198,259	80,211	488,191	327,704	1,563,334
Southern California	2002 Existing	181,529	13,872	509,896	1,189,393	486,846	565,802	1,557,347	890,477	3,798,612	1,280,179	10,473,953
	2035 No-Project	151,991	15,133	581,680	1,571,806	648,545	759,692	2,147,899	1,107,800	6,674,258	1,868,052	15,526,855
	2035 Modal	151,991	15,392	590,842	1,592,868	664,525	769,650	2,176,131	1,117,373	6,738,941	1,882,372	15,700,084
	2035 HST	151,991	15,428	591,960	1,597,916	667,885	770,724	2,179,376	1,120,550	6,752,033	1,886,842	15,734,703
Rest of State	2002 Existing	246,365	6,096	171,131	215,459	88,512	136,204	406,082	214,575	861,643	376,152	2,722,219
	2035 No-Project	234,778	6,981	195,990	323,751	106,453	175,554	523,398	280,041	1,394,589	578,718	3,809,552
	2035 Modal	234,778	7,041	194,937	320,898	105,569	173,072	521,139	279,585	1,388,881	578,121	3,793,320
	2035 HST	234,778	7,127	197,278	325,155	106,779	174,179	526,436	279,179	1,393,265	582,547	3,816,023
Statewide Total	2002 Existing	797,024	36,868	1,019,178	2,045,736	892,484	994,982	2,924,801	1,638,662	6,888,500	2,549,657	19,787,892
	2035 No-Project	1,024,333	44,373	1,164,480	2,695,850	1,140,186	1,291,184	3,854,241	2,026,664	12,003,351	3,639,082	28,873,042
	2035 Modal	1,024,333	44,855	1,177,209	2,722,842	1,165,664	1,302,368	3,893,384	2,042,179	12,095,366	3,660,965	29,118,465
	2035 HST	1,024,333	45,142	1,186,545	2,741,565	1,177,215	1,308,771	3,917,726	2,064,227	12,179,826	3,682,695	29,317,346

Source: Cambridge Systematics, Inc., 2003.

Table 4.13 Allocation of Incremental Employment Growth by Industry Groupings*

Year 2020

REMI Region		Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Bay Area	2020 Modal	0%	0%	7%	9%	17%	5%	15%	6%	38%	2%	100%
	2020 HST	0%	0%	7%	9%	13%	5%	15%	7%	40%	4%	100%
North Central Valley	2020 Modal	0%	0%	7%	9%	9%	5%	20%	9%	37%	4%	100%
	2020 HST	0%	0%	6%	5%	4%	4%	15%	15%	47%	4%	100%
South Central Valley	2020 Modal	0%	1%	6%	11%	4%	5%	18%	7%	43%	5%	100%
	2020 HST	0%	1%	6%	8%	4%	4%	17%	9%	44%	7%	100%
Southern California	2020 Modal	0%	0%	7%	11%	8%	7%	19%	6%	38%	3%	100%
	2020 HST	0%	0%	7%	11%	9%	6%	18%	6%	38%	4%	100%
Rest of State	2020 Modal**	0%	0%	8%	16%	5%	16%	16%	3%	34%	2%	100%
	2020 HST	0%	2%	29%	17%	2%	-31%	57%	-6%	-5%	36%	100%
Statewide Total	2020 Modal	0%	0%	7%	10%	10%	5%	19%	6%	39%	3%	100%
	2020 HST	0%	0%	7%	10%	8%	5%	17%	8%	40%	5%	100%

Source: Cambridge Systematics, Inc., 2003.

* Values for the Modal and HST alternatives indicate the percentage of total employment change (as compared to the No-Project Alternative) that occurs within each of the industry groups.

** The Modal alternative is projected to reduce employment in the "rest of state" compared to the No-Project alternative. Positive values within this row indicate an employment reduction for the industry group compared to the No-Project.

Table 4.14 Allocation of Incremental Employment Growth by Industry Groupings*
Year 2035

REMI Region		Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Bay Area	2035 Modal	0%	0%	5%	11%	17%	4%	13%	6%	38%	7%	100%
	2035 HST	0%	0%	5%	11%	13%	4%	12%	7%	40%	8%	100%
North Central Valley	2035 Modal	0%	0%	6%	9%	8%	4%	18%	9%	35%	11%	100%
	2035 HST	0%	0%	4%	5%	3%	3%	12%	16%	47%	9%	100%
South Central Valley	2035 Modal	0%	1%	6%	11%	3%	4%	15%	7%	41%	12%	100%
	2035 HST	0%	1%	6%	9%	3%	4%	14%	8%	42%	13%	100%
Southern California	2035 Modal	0%	0%	5%	12%	9%	6%	16%	6%	37%	8%	100%
	2035 HST	0%	0%	5%	13%	9%	5%	15%	6%	37%	9%	100%
Rest of State	2035 Modal**	0%	0%	6%	18%	5%	15%	14%	3%	35%	4%	100%
	2035 HST	0%	2%	20%	22%	5%	-21%	47%	-13%	-20%	59%	100%
Statewide Total	**2035 Modal**	**0%**	**0%**	**5%**	**11%**	**10%**	**5%**	**16%**	**6%**	**37%**	**9%**	**100%**
	2035 HST	**0%**	**0%**	**5%**	**10%**	**8%**	**4%**	**14%**	**8%**	**40%**	**10%**	**100%**

Source: Cambridge Systematics, Inc., 2003.

* Values for the Modal and HST alternatives indicate the percentage of total employment change (as compared to the No-Project Alternative) that occurs within each of the industry groups.

** The Modal alternative is projected to reduce employment in the "rest of state" compared to the No-Project alternative. Positive values within this row indicate an employment reduction for the industry group compared to the No-Project.

The Modal Alternative[4] is projected to increase regional population by about 16,000 in 2020, and an additional 42,000 between 2020 and 2035. Employment is projected to increase by 27,000 and an additional 16,000 for these two time periods. Santa Clara County is projected to experience the largest absolute increase in population and employment, although increases will also be strong in Alameda and San Francisco Counties. The employment growth rates are very similar for all counties (about 0.5 percent in 2020 and 0.8 percent in 2035). The population growth rates are also similar for all counties (about 0.2 percent in 2020 and 0.6 percent in 2035), except San Francisco, for which the Modal Alternative is expected to increase population by about 1.6 percent. Population and employment growth rates are projected to be roughly equivalent within each of the counties for year 2035.

The HST Alternative[4] is projected to increase regional population by about 44,000 in 2020, and an additional 105,000 between 2020 and 2035. Employment is projected to increase by about 60,000 and an additional 36,000 for these two time periods. Santa Clara County is projected to experience the largest absolute increase in population and employment, although increases will also be strong in San Francisco, San Mateo, and Alameda Counties. The employment growth rates vary between counties, with the highest rates for year 2035 (about 2.5 percent) experienced in San Mateo and San Francisco; population growth rates are also strongest in these two counties (about 4.7 percent for San Francisco and 2.6 percent for San Mateo). Population growth rates are projected to be higher than employment growth rates in San Francisco and Santa Clara Counties, with the opposite result observed in Solano County; remaining counties will have growth rates that are roughly equal. Population and employment growth rates for the HST Alternative are slightly higher than growth rates for the Modal Alternative in each county and for both analysis years.

Historically, this region has exceeded the statewide average in terms of percent of employment in the finance, insurance, and real estate (FIRE) and services industry groups. This trend is projected to intensify under the No-Project Alternative, with this region projecting the largest percentage shift in employment from manufacturing, trade, and transportation, communications, and utilities (TCU) into FIRE and services. Incremental job growth under the Modal Alternative is projected to be more heavily oriented towards manufacturing, trade, and TCU; in fact, this is the only region for which incremental growth for these three industries (45 percent of total) is projected to exceed growth in FIRE and services (44 percent of total). Incremental job growth for the HST Alternative is projected to follow historical norms for this region, with 47 percent of growth in FIRE and services and 40 percent in manufacturing, trade, and TCU.

[4] All results for the Modal and HST Alternatives in Section 4.3 are expressed relative to the No-Project Alternative.

4.3.2 Northern Central Valley

Under the No-Project Alternative, the Northern Central Valley region is projected to add about 555,000 jobs and 1.1 million people between now and 2020, and a further 355,000 jobs and 1.1 million people between 2020 and 2035. The 2035 totals represent a relative employment increase of 77percent from the current 2.9 million residents, and employment increase of 60 percent from the current 1.5 million jobs. Sacramento County is projected to add the most population (740,000) and employment (280,000) from current levels. However, growth rates will be higher in all other counties, with the highest rates (in excess of 130 percent) projected for Madera County. Under this alternative, year 2035 population growth rates exceed employment growth rates for all counties, except Madera. The key conclusion from these results is that this region will be experiencing tremendous population growth, and to a slightly lesser extent employment growth, even under the No-Project Alternative.

The Modal Alternative[4] is projected to increase regional population by about 4,000 in 2020, and an additional 35,000 between 2020 and 2035. Employment is projected to increase by 11,000 and an additional 19,000 for these two time periods. Sacramento and San Joaquin Counties are projected to experience the largest (and roughly equal) absolute increases in population and employment. Employment growth rates vary among the counties, and are projected to be highest in San Joaquin County (about 1.0 percent in 2020 and 2.2 percent in 2035). The population growth rates are similar for all counties in 2020 (about 0.1 percent), but vary more widely in 2035 (San Joaquin County having the highest rate at 1.1 percent). Employment growth rates are projected be about one-half to one percent higher than population growth rates within each of the counties.

The HST Alternative[4] is projected to increase regional population by about 20,000 in 2020, and an additional 100,000 between 2020 and 2035. Employment is projected to increase by about 43,000 and an additional 60,000 for these two time periods. Sacramento County is projected to experience the largest absolute increase in population and employment, and is second only to Los Angeles County in the number of jobs that are projected to be added through the HST Alternative. Sacramento, San Joaquin, and Stanislaus Counties are all projected to add more jobs than people by 2035 with the HST Alternative; this result is not found to this extent in any other region. Although the Northern Central Valley is projected to have less than 10 percent of total statewide employment under the No-Project Alternative in 2035, the region is projected to attract over 25 percent of the statewide job growth related to the HST Alternative[5].

The population and employment growth rates vary widely between counties, with population and particularly employment growth rates higher for the HST Alternative than for the Modal Alternative in each county. For 2020, Merced County has by far the highest population and employment growth rates under the HST Alternative, with both in excess of four percent; Sacramento and Stanislaus Counties have employment growth rates in

[5] The comparable value for the Modal Alternative is 12.5 percent of statewide job growth.

excess of two percent. For 2035, Merced County is projected to experience growth rates in excess of six percent, with strong employment growth also projected for Sacramento, Stanislaus, and San Joaquin Counties. Employment growth rates are projected to be roughly equal to or higher than population growth rates for all counties in 2020. This result repeats in 2035 for all counties except Merced.

For Merced County, analysis results suggest that about 88 percent of population and employment growth experienced with the HST Alternative would have occurred anyway under the No-Project Alternative. Of the remaining 12 percent of growth experienced with the HST Alternative, one-half of the employment increase and three-quarters of the population increase occurs due to intraregional shifts in residential location.[6] These shifts represent new residents to the region (and associated household services) who, under the No-Project Alternative, have a job in the Bay Area but endure a long distance commute from Sacramento, Stanislaus, or San Joaquin Counties. With the availability of HST service, these long-distance commuters would decide to initially locate in Merced County (rather than Sacramento, Stanislaus, or San Joaquin Counties) to take advantage of lower housing costs and improved commute access into the Bay Area via HST.

This region has historically exceeded statewide averages for government and farming jobs, while lagging in all other industry groups. This general pattern is projected to change slightly under the No-Project Alternative, with employment shifts from government into farming and from manufacturing, trade, and TCU into FIRE and services. Incremental job growth under the Modal Alternative is projected to roughly follow historical statewide averages, with 39 percent of job growth in manufacturing, trade, and TCU, and 44 percent in FIRE and services. The HST Alternative, on the other hand, is projected to have incremental job growth that is much more heavily oriented towards FIRE and services (63 percent of total), with manufacturing, trade, and TCU accounting for about 23 percent of incremental growth. This is far and away the largest shift in the nature of employment for any region and alternative, and suggests that the HST Alternative will be a strong influence in attracting higher wage jobs to the Central Valley.

4.3.3 Southern Central Valley

Under the No-Project Alternative, the Southern Central Valley region is projected to add about 360,000 jobs and 860,000 people between now and 2020, and a further 190,000 jobs and 950,000 people between 2020 and 2035. The 2035 totals represent a relative employment increase of 87 percent from the current 2.0 million residents, and employment increase of 56 percent from the current 1.0 million jobs. This region experiences the largest differential between employment and population growth rates under the No-Project

[6] The remaining one-half of employment increase and one-quarter of population increase (relative to the No-Project Alternative) in Merced County represent business attraction and expansion, population growth for this business increase, and additional interregional shifts in household location for long-distance commuting.

Alternative, suggesting a continued emphasis on long distance commuting from this region to Southern California and the Bay Area.

Fresno County is projected to add the most jobs (260,000) from current levels, although job growth is also strong for Kern County (200,000). Kern County is projected to add the most population (755,000) of any individual county outside of the Southern California region, with population increases in Fresno and Tulare Counties also quite strong. Population growth rates will be roughly double or triple the employment growth rates between now and 2035 in Kern, Kings, and Tulare Counties; these rates are of the same general magnitude for Fresno County.

The Modal Alternative[4] is projected to increase regional population by about 5,000 in 2020, and an additional 15,000 between 2020 and 2035. Employment is projected to increase by 8,000 and an additional 7,000 for these two time periods. Fresno County is projected to experience the largest absolute increase in population and employment, although increases will also be strong in Kern County. Employment and population growth rates follow the same general county trends as seen for the absolute changes. Employment growth rates are projected to be about 0.5 percent higher than population growth rates within each of the counties for both analysis years.

The HST Alternative[4] is projected to increase regional population by about 11,000 in 2020, and an additional 32,000 between 2020 and 2035. Employment is projected to increase by about 15,000 and an additional 14,000 for these two time periods. Fresno County is projected to experience the largest absolute increase in population and employment, with a much stronger increase than for the remaining three counties in the region. The employment and population growth rates in Fresno County are also double to triple the values in adjacent counties in the region. Employment growth rates are projected to be about 0.5 to 1.0 percent higher than population growth rates within each of the counties for both analysis years. Also, population and employment growth rates for the HST Alternative are between 0.1 and 1.5 percent higher than growth rates for the Modal Alternative in each county and for both analysis years.

This region has historically exceeded statewide averages for government and farming jobs, while lagging in all other industry groups to a larger extent than any other region. This general pattern is projected to change under the No-Project Alternative, with employment shifts from farming into FIRE and services. However, this region will still lag statewide averages in manufacturing, FIRE and services, while exceeding statewide averages in government. Incremental job growth is projected to be similar under the Modal and HST Alternatives, with about one-half of growth in FIRE and services and one-quarter of growth in manufacturing, trade, and TCU; these values are consistent with statewide averages under the No-Project Alternative.

4.3.4 Southern California

Under the No-Project Alternative, the Southern California region is projected to add about 3.7 million jobs and 5.0 million people between now and 2020, and a further 1.4 million

jobs and 5.3 million people between 2020 and 2035. The 2035 totals represent a relative employment increase of 53 percent from the current 19.5 million residents, and employment increase of 48 percent from the current 10.5 million jobs.

Los Angeles County is projected to add the most jobs (2.0 million) and population (3.3 million) from current levels. Job growth is also projected to be very strong in San Diego and Orange Counties, with large population increases also experienced in all other counties in the region. Population growth rates will greatly exceed employment growth rates in San Bernardino and Riverside Counties, with the opposite result for Orange County. Results indicated that Orange County is projected to add an equal number of residents and jobs by 2035, while Riverside and Orange Counties will each add about four times as many residents as jobs.

The Modal Alternative[4] is projected to increase regional population by about 65,000 in 2020, and an additional 190,000 between 2020 and 2035. Employment is projected to increase by 100,000 and an additional 75,000 for these two time periods. Los Angeles County is projected to experience the largest absolute increase in population and employment, although increases will also be strong in Orange and San Diego Counties. Employment and population growth rates fall within a relatively small range of 0.5 to 1.5 percent for all counties. Employment growth rates are projected to be from zero to 0.5 percent higher than population growth rates within each of the counties for both analysis years.

The HST Alternative[4] is projected to increase regional population by about 80,000 in 2020, and an additional 245,000 between 2020 and 2035. Employment is projected to increase by about 120,000 and an additional 90,000 for these two time periods. As with the Modal Alternative, Los Angeles County is projected to experience the largest absolute increase in population and employment with strong increases also experienced in Orange and San Diego Counties. Employment growth rates are projected to be about 0.1 to 0.5 percent higher than population growth rates within each of the counties for both analysis years. As occurred with Merced County, results for Riverside County are influenced by an intraregional population and employment shift. Analysis results suggest that some population and employment growth will shift from Riverside to San Bernardino County to take advantage of lower housing costs and improved commute accessibility via HST.

This region has historically tracked statewide averages in most industry groups, except farming, where it has lagged the statewide average. This general pattern is projected to continue under the No-Project Alternative. Incremental job growth is projected to be similar under the Modal and HST Alternatives, with about 43 percent of growth in FIRE and services and another 43 percent of growth in manufacturing, trade, and TCU. Both the Modal and HST Alternatives will lead to stronger job growth in the manufacturing, trade, and TCU than would exist under the No-Project Alternative.

4.4 Sensitivity to Base Forecasts for Population and Employment

The methodology for this analysis provides reliable estimates of the differences (or *deltas*) in employment and population from the No-Project Alternative to the Modal and HST Alternatives. The methodology, however, is not intended to improve upon the validity, reliability, or details provided in the base case population and employment forecasts. These base case forecasts, which relied on data developed by the DOF, Caltrans, Woods and Poole and REMI, represent the best-available information on long-term economic and demographic conditions in the State. Nonetheless, the base case forecasts rely on many assumptions of future background conditions and are subject to the same uncertainties as any other long range forecast.

The population and employment *deltas*, measured in percentage terms, are not likely to differ as a result of changes in the base case population and employment forecasts if these changes are somewhat equally distributed throughout the State or across many economic sectors. A change that is concentrated in one part of the State or within one sector of the economy, however, could lead to different deltas. It is reasonable, therefore, to consider how a significant change from the base case population or employment forecasts would affect the *deltas* calculated by the methodology. This sensitivity discussion investigates three possible scenarios to illustrate how the *deltas* might change under alternative base case forecasts of population and employment.

Reduced Employment Growth in the FIRE Sector

The analysis indicated that the HST Alternative could lead to higher growth in the FIRE sector since this sector benefits more than manufacturing and warehousing from the accessibility improvements afforded by HST passenger travel. FIRE employment has been growing steadily in California for the past fifty years, and the economic downturns have not resulted in any significant long-term divergence. Nevertheless, a possible scenario could see FIRE employment stagnates because of growing automation and off-shore substitution (e.g., in-house software design and call centers moving to India). Such a scenario would diminish the advantages HST would bring to the FIRE sector and thus reduce the employment *delta* for FIRE under the HST Alternative. It would be expected, however, that the Central Valley region would still see disproportionate growth in the FIRE sector because some of the state's existing FIRE jobs would migrate to the Central Valley HST station areas due to cheaper land and lower wage rates outside the Southern California and Bay Area regions.

Rapid Growth in Warehousing and Manufacturing Activity

The Modal Alternative is expected to achieve stronger growth in the TCU sector since this sector depends on trucking and warehousing activities that would benefit from the Modal

Alternative's increased roadway capacity. TCU employment trends have been more variable than the FIRE sector but nonetheless growing in California due to the increase in import and export activity through California's major ports. As trade activity recovers from the Asian recessions and manufacturing continues to move overseas, warehousing and distribution throughout California could accelerate under the base case employment forecasts. This scenario might be expected to lead to a larger increase in the TCU employment *deltas* for the Modal Alternative (relative to the HST Alternative). Although this scenario would increase overall employment growth for both the Modal and HST Alternatives, the difference in total statewide employment between these two alternatives would be less than the 200,000 job difference, as identified in Section 4.1.3, under the original base case forecasts.

Higher Than Expected Growth in State Population

While natural drivers of population growth (birth rates and death rates) may be projected with some certainty, political factors influencing in-migration and out-migration could lead to differences from the base case population forecast. A prolonged recession in Mexico or other Central or South American nation, for example, could increase immigration into California. This divergence from the DOF forecast could swell the ranks of unskilled labor throughout the State. The impacts on the employment and population *deltas*, however, would be minimal, since the Modal and HST Alternatives attract additional population related to employment opportunities in specific industries sectors. These industry sectors tend to rely on access to skilled labor and goods movement, and even a drastic increase in unskilled labor would have a minimal effect on industry growth under the Modal and HST Alternatives.

4.5 Key Findings

Overall, the system alternatives and HST design options represent very similar levels of growth effects in terms of population and employment growth from year 2002 existing conditions. The incremental effect of the Modal and HST Alternatives relative to the No-Project Alternative is very small when compared to the incremental effect of the No-Project Alternative relative to 2002 existing conditions. California is projected to add about 9.1 million jobs and 19.4 million people between 2002 and 2035 under the No-Project Alternative. The Modal Alternative would add an additional 250,000 jobs and 360,000 people, while the HST Alternative would add 450,000 jobs and 700,000 people over the No-Project Alternative. These additions for the Modal and HST Alternative represent increases of about 0.8 percent and 1.4 percent, respectively, compared to projections for the No-Project Alternative.

Analysis of results for individual counties largely follows these general statewide trends among system alternatives. Southern California is projected to add the most jobs and people of all regions for the Modal and HST Alternatives in 2035. On a relative basis,

Southern California is projected to have the largest percentage increase in population for the Modal Alternative, while the Northern Central Valley has the largest percentage increase for the HST Alternative. The Northern Central Valley is projected to have the largest percentage increase in employment for the Modal and HST Alternatives. The HST Alternative creates some larger incremental population and employment growth relative to the other system alternatives in some Central Valley counties between Sacramento and Fresno. However, in all cases except Sacramento County, the incremental employment effect is much larger than the incremental population effect, suggesting that the HST Alternative has a stronger influence in distributing employment throughout the State.

Differences exist between the Modal and HST Alternatives in the types of jobs that are expected to be created. The HST Alternative has relatively stronger job growth in the FIRE, services, and government sectors, while the Modal Alternative has relatively stronger job growth in TCU, manufacturing, and wholesale and retail trade. These differences are strongest in the northern Central Valley region and the "rest of state" regions. In fact, the Modal Alternative is expected to create a net loss in population and employment in the "rest of state" region. This net loss and the overall modest growth effects for the Modal Alternative can be linked to two primary influences:

1. Gas tax, user fees, and other funding increases to pay for the additional cost of the Modal Alternative relative to the HST Alternative.

2. A greater concentration of travel time benefits within the primary analysis counties under the Modal Alternative since the highway and aviation projects for the Modal Alternative tend to have their primary congestion reduction effect in a confined geographic area. Alternatively, the HST Alternative creates significant benefits for riders who travel to or from counties that are beyond the primary "HST counties."

5.0 Station Area Growth Effects

5.0 Station Area Growth Effects

This chapter describes how regional population and employment growth could influence the amount of urbanized land required to accommodate the people living and working in each part of the State. The first section compares the projected statewide effects of each system alternative, and is followed by a second section that discusses results for the HST design options. The third section describes how various regions of the State and individual counties are impacted. Finally, the fourth section provides a summary overview of the significance of these findings. The discussion in this chapter is supplemented by detailed tables of results in Appendices J (Employment Suballocation) and K (Breakout of Employment and Residential Components).

5.1 Statewide Comparison of System Alternatives

Table 5.1 summarizes the total acreage of land at urbanized densities needed to accommodate projected employment or population in 2020. Table 5.2 summarizes the total acreage of urbanized land needed in 2035. Tables 5.3 and 5.4 show the percent change in urbanized land area from the 2002 existing conditions, while Tables 5.5 and 5.6 show the same percent change relative to the No-Project Alternative. All tables summarize results by county, region, and statewide for the counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

5.1.1 No-Project Alternative

On a statewide basis, population and employment growth under the No-Project Alternative is expected to require approximately 777,000 more acres of urbanized land in 2020 than the current estimated urbanized area of approximately 3,142,000 acres.[1] This represents an increase of 25 percent over less than 20 years. In the following 15 years, an additional area of approximately 728,000 acres is projected to be urbanized. This 2020-2035 increase represents an additional 19 percent increase from 2020, for a total increase of 48 percent in less than 35 years.

[1] Estimates of current urbanized area are based on urban land cover data provided by the California Farmland Mapping and Monitoring Program (CFMMP), a division of the California Department of Conservation.

Table 5.1 Year 2020 Size of Urbanized Area by System Alternative
County and Regional Totals

County	2002 Existing Conditions	2020		
		No-Project	Modal	HST Base
Alameda	141,654	162,641	163,207	162,749
Contra Costa	142,467	157,027	157,364	157,675
San Francisco	23,277	26,691	26,823	27,039
San Mateo	70,869	77,354	77,624	78,223
Santa Clara	184,481	202,506	202,814	203,750
Solano	53,757	66,287	66,601	66,954
Bay Area*	616,505	692,506	694,434	696,389
Madera	23,255	35,541	35,560	35,354
Merced	31,712	43,733	43,767	45,055
Sacramento	157,101	181,366	181,542	181,049
San Joaquin	74,250	118,728	119,550	114,704
Stanislaus	55,426	71,061	71,241	69,612
Yolo	26,342	31,830	31,846	31,331
North Central Valley*	368,086	482,259	483,506	477,104
Fresno	96,977	138,145	139,606	139,346
Kern	111,468	167,874	168,177	173,910
Kings	29,479	36,632	36,670	37,100
Tulare	48,656	71,735	71,782	71,946
South Central Valley*	286,580	414,386	416,236	422,302
Los Angeles	763,373	821,378	824,536	806,720
Orange	273,713	316,502	317,721	315,270
Riverside	255,230	389,471	390,161	384,642
San Bernardino	237,905	364,448	364,980	367,724
San Diego	340,837	437,960	440,834	438,420
Southern California*	1,871,058	2,329,760	2,338,231	2,312,775
Influence Area Totals	**3,142,229**	**3,918,910**	**3,932,407**	**3,908,570**

Source: Cambridge Systematics, Inc., 2003.
* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table 5.2 Year 2035 Size of Urbanized Area by System Alternative
County and Regional Totals

County	2002 Existing Conditions	2035		
		No-Project	Modal	HST Base
Alameda	141,654	170,941	171,868	171,225
Contra Costa	142,467	163,617	164,216	164,874
San Francisco	23,277	27,921	28,081	28,345
San Mateo	70,869	80,517	80,930	81,267
Santa Clara	184,481	232,167	233,601	235,404
Solano	53,757	75,121	75,791	76,634
Bay Area*	616,505	750,284	754,488	757,749
Madera	23,255	46,926	47,047	45,329
Merced	31,712	55,964	56,242	57,212
Sacramento	157,101	197,843	198,820	202,471
San Joaquin	74,250	142,650	144,711	137,960
Stanislaus	55,426	96,993	97,968	93,562
Yolo	26,342	37,874	38,002	37,022
North Central Valley*	368,086	578,250	582,790	573,557
Fresno	96,977	186,908	189,641	189,503
Kern	111,468	221,030	222,407	226,851
Kings	29,479	43,576	43,655	44,910
Tulare	48,656	98,077	98,192	97,841
South Central Valley*	286,580	549,590	553,895	559,105
Los Angeles	763,373	916,904	926,720	881,982
Orange	273,713	328,269	328,795	323,189
Riverside	255,230	516,122	549,163	539,816
San Bernardino	237,905	496,637	497,983	498,004
San Diego	340,837	510,542	518,224	510,567
Southern California*	1,871,058	2,768,473	2,820,884	2,753,557
Influence Area Totals	**3,142,229**	**4,646,596**	**4,712,057**	**4,643,968**

Source: Cambridge Systematics, Inc., 2003.
* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table 5.3 Year 2020 Size of Urbanized Area by System Alternative

Percent Change from 2002 Existing Conditions

County	2002 Existing Conditions	2020		
		No-Project	Modal	HST Base
Alameda	-	15%	15%	15%
Contra Costa	-	10%	10%	11%
San Francisco	-	15%	15%	16%
San Mateo	-	9%	10%	10%
Santa Clara	-	10%	10%	10%
Solano	-	23%	24%	25%
Bay Area*	-	12%	13%	13%
Madera	-	53%	53%	52%
Merced	-	38%	38%	42%
Sacramento	-	15%	16%	15%
San Joaquin	-	60%	61%	54%
Stanislaus	-	28%	29%	26%
Yolo	-	21%	21%	19%
North Central Valley*	-	31%	31%	30%
Fresno	-	42%	44%	44%
Kern	-	51%	51%	56%
Kings	-	24%	24%	26%
Tulare	-	47%	48%	48%
South Central Valley*	-	45%	45%	47%
Los Angeles	-	8%	8%	6%
Orange	-	16%	16%	15%
Riverside	-	53%	53%	51%
San Bernardino	-	53%	53%	55%
San Diego	-	28%	29%	29%
Southern California*	-	25%	25%	24%
Influence Area Totals	**-**	**25%**	**25%**	**24%**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table 5.4 Year 2035 Size of Urbanized Area by System Alternative

Percent Difference from 2002 Existing Conditions

County	2002 Existing Conditions	2035		
		No-Project	Modal	HST Base
Alameda	-	21%	21%	21%
Contra Costa	-	15%	15%	16%
San Francisco	-	20%	21%	22%
San Mateo	-	14%	14%	15%
Santa Clara	-	26%	27%	28%
Solano	-	40%	41%	43%
Bay Area*	-	22%	22%	23%
Madera	-	102%	102%	95%
Merced	-	76%	77%	80%
Sacramento	-	26%	27%	29%
San Joaquin	-	92%	95%	86%
Stanislaus	-	75%	77%	69%
Yolo	-	44%	44%	41%
North Central Valley*	-	57%	58%	56%
Fresno	-	93%	96%	95%
Kern	-	98%	100%	104%
Kings	-	48%	48%	52%
Tulare	-	102%	102%	101%
South Central Valley*	-	92%	93%	95%
Los Angeles	-	20%	21%	16%
Orange	-	20%	20%	18%
Riverside	-	102%	115%	112%
San Bernardino	-	109%	109%	109%
San Diego	-	50%	52%	50%
Southern California*	-	48%	51%	47%
Influence Area Totals	**-**	**48%**	**50%**	**48%**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table 5.5 Year 2020 Size of Urbanized Area by System Alternative

Percent Change from 2020 No-Project Alternative

County	2002 Existing Conditions	2020		
		No-Project	Modal	HST Base
Alameda	n/a	–	0.35%	0.07%
Contra Costa	n/a	–	0.21%	0.41%
San Francisco	n/a	–	0.50%	1.30%
San Mateo	n/a	–	0.35%	1.12%
Santa Clara	n/a	–	0.15%	0.61%
Solano	n/a	–	0.47%	1.01%
Bay Area*	n/a	–	0.28%	0.56%
Madera	n/a	–	0.05%	-0.53%
Merced	n/a	–	0.08%	3.02%
Sacramento	n/a	–	0.10%	-0.17%
San Joaquin	n/a	–	0.69%	-3.39%
Stanislaus	n/a	–	0.25%	-2.04%
Yolo	n/a	–	0.05%	-1.57%
North Central Valley*	n/a	–	0.26%	-1.07%
Fresno	n/a	–	1.06%	0.87%
Kern	n/a	–	0.18%	3.60%
Kings	n/a	–	0.10%	1.28%
Tulare	n/a	–	0.07%	0.29%
South Central Valley*	n/a	–	0.45%	1.91%
Los Angeles	n/a	–	0.38%	-1.78%
Orange	n/a	–	0.39%	-0.39%
Riverside	n/a	–	0.18%	-1.24%
San Bernardino	n/a	–	0.15%	0.90%
San Diego	n/a	–	0.66%	0.10%
Southern California*	n/a	–	0.36%	-0.73%
Influence Area Totals	**n/a**	**–**	**0.34%**	**-0.26%**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table 5.6 Year 2035 Size of Urbanized Area by System Alternative

Percent Change from 2035 No-Project Alternative

County	2002 Existing Conditions	2035		
		No-Project	Modal	HST Base
Alameda	n/a	–	0.54%	0.17%
Contra Costa	n/a	–	0.37%	0.77%
San Francisco	n/a	–	0.57%	1.52%
San Mateo	n/a	–	0.51%	0.93%
Santa Clara	n/a	–	0.62%	1.39%
Solano	n/a	–	0.89%	2.01%
Bay Area*	n/a	–	0.56%	1.00%
Madera	n/a	–	0.26%	-3.40%
Merced	n/a	–	0.50%	2.23%
Sacramento	n/a	–	0.49%	2.34%
San Joaquin	n/a	–	1.45%	-3.29%
Stanislaus	n/a	–	1.00%	-3.54%
Yolo	n/a	–	0.34%	-2.25%
North Central Valley*	n/a	–	0.79%	-0.81%
Fresno	n/a	–	1.46%	1.39%
Kern	n/a	–	0.62%	2.63%
Kings	n/a	–	0.18%	3.06%
Tulare	n/a	–	0.12%	-0.24%
South Central Valley*	n/a	–	0.78%	1.73%
Los Angeles	n/a	–	1.07%	-3.81%
Orange	n/a	–	0.16%	-1.55%
Riverside	n/a	–	6.40%	4.59%
San Bernardino	n/a	–	0.27%	0.28%
San Diego	n/a	–	1.50%	0.00%
Southern California*	n/a	–	1.89%	-0.54%
Influence Area Totals	**n/a**	**–**	**1.41%**	**-0.06%**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

As discussed in Section 4.0, population is projected to grow by 27 percent between now and 2020, and by 54 percent between now and 2035. Likewise, employment is projected to grow by 34 percent between now and 2020, and by 46 percent between now and 2035. Hence, urbanization of undeveloped land is expected to occur at lower rates than overall population and employment growth, reflecting a number of factors:

- A reduction in availability of undeveloped land in some urban counties in the Bay Area and Southern California, creating higher land costs and market forces for denser development.

- Slight increases in infill and redevelopment, as seen recently in many of the urban counties; and

- An increase in marginal residential densities that has occurred over recent years.

5.1.2 Modal Alternative

Land consumption for the Modal Alternative is projected to be of the same magnitude as the No-Project Alternative for 2020 and 2035 when compared to 2002 existing conditions. By 2020, the Modal Alternative is expected to require approximately 13,500 acres more than the 2020 No-Project Alternative, with this difference increasing to 65,500 acres by 2035. These land consumption differences reflects increases of 0.34 percent in 2020 and 1.4 percent in 2035 over needs for the No-Project Alternative.

These land consumption increases relative to the No-Project Alternative are larger than the corresponding increases in population and employment, as had been shown in Tables 4.5 and 4.6.[2] This result suggests that the Modal Alternative is slight less effective than the No-Project Alternative at supporting higher density development styles. The result also likely reflects the fact that the Modal Alternative had its strongest relative employment growth in lower density industrial sectors, such as TCU and retail.

5.1.3 HST Alternative

Base Analysis

Land consumption for the HST Alternative is projected to be of the same magnitude as the No-Project and Modal Alternatives for 2020 and 2035 when compared to the 2002 existing conditions. Nonetheless, the HST Alternative is projected to consume somewhat less land

[2] Employment growth for the Modal Alternative (relative to the No-Project Alternative) has been estimated at 0.5 percent and 0.8 percent in 2020 and 2035, respectively. Population growth for the Modal Alternative has been estimated at 0.2 percent and 0.7 percent in 2020 and 2035, respectively.

than the other system alternatives, even though the HST Alternative is associated with slightly higher levels of population and employment growth. These results are driven by the same factors mentioned for the Modal Alternative combined with stronger employment growth in the services and FIRE sectors and market forces supporting denser station-area development for office-style facilities.

In 2020, approximately 10,300 acres less urbanized land is expected to be required to accommodate the population and employment under the HST Alternative than under the No-Project Alternative. By 2035, this difference declines to about 2,600 acres. The 2035 total represents a decrease of less than 0.1 percent from the No-Project Alternative. These results suggest that the development intensification effects of HST, especially near its stations, will overrun the pressures of increased population and employment, at least until 2035.

The HST Alternative also requires less land than the Modal Alternatives, especially by 2035. In 2035, the HST Alternative consumes approximately 68,100 fewer acres of non-urbanized land than the Modal Alternatives. This represents a savings of approximately 1.4 percent.

Sensitivity Analysis

Unlike the other system alternatives, a high-speed train provides an opportunity for local governments to focus more intensive land uses around rail stations. This opportunity arises in part from the differences in employment mix for the system alternatives,[3] as well as the competitive advantage that some industry groups might draw from proximity to an HST service.[4]

As reported in Section 3.3, higher density, mixed-use development has been observed around rail stations in Europe, Japan, and the United States. While much of this densification is a result of market forces, research suggests that government intervention can accelerate or increase its effect. Strategies for *increasing* station area development include policies such as zoning that encourages mixed use, density bonuses, and maximum parking requirements. Strategies for *accelerating* station area development include joint

---

[3] The employment sectors with the highest relative growth in the HST Alternative are concentrated in areas such as FIRE; research and development; health services, etc. These employment sectors tend to be associated with office-style developments that are most compatible with higher density development. The No-Project and Modal Alternatives are expected to have stronger relative employment growth in sectors such as TCU and retail trade, which tend to be associated with lower density, freeway-oriented developments.

[4] These competitive advantages accrue to some industries due to their need for close proximity to ancillary industries (i.e., industry clustering) and a well-educated labor force. These advantages, known as *economies of agglomeration*, have emerged around the French and Japanese HST stations, and are an accepted norm for land use planning for many urban transit station areas in Europe and North America.

development under public private partnerships, tax-increment finance, locating civic institutions near stations, tax abatement programs, and other subsidies.

In addition to the base, or "market trends", analysis, a sensitivity-analysis was performed to test the land consumption effects of land use densification strategies to modestly increase development density in the vicinity of HST stations. The sensitivity analysis included two assumptions:

- For the residential land area projections, the rate of infill development around stations would double; and

- For the employment land area projections, the development density in the station area was increased from the 55th percentile to the 65th percentile in 2020 and from the 75th percentile to the 90th percentile in 2035. Development densities outside of the station area were not modified.

Table 5.7 compares the effects that this land use densification scenario could have on development patterns. This scenario could reduce statewide land consumption by approximately 13,700 acres in 2020 (0.35 percent) and 30,400 acres in 2035 (0.65 percent), compared to the Market Trends scenario. This reduction allows the HST Alternative to consume approximately 24,000 acres (0.61 percent) less than the No-Project Alternative in 2020, and approximately 33,000 acres (0.71 percent) in 2035. By 2035, the land use densification scenario increases the savings in urban land consumption from the No-Project Alternative by more than 10 times that of the Market Trends scenario.

These results represent a low-end estimate of the possible effects of land use densification strategies in combination with the introduction of HST service. This sensitivity test assessed the effects of densification strategies within a nominal one-mile band of a potential HST site. Our research suggests that other jurisdictions have had some success in implementing more aggressive and regionwide land use strategies (e.g., urban growth boundaries, maximum parking requirements, jobs housing balance, more diversity of land uses, higher densities, higher service levels of mass transit, etc.) in conjunction with high-capacity intercity and urban transit services. Experience in these areas suggests that more aggressive strategies might be more attractive to policy makers since HST could offer the economic rationale to developers to cluster their new commercial, industrial, and residential development within easy access to the HST stations. In general, the No-Project and Modal Alternatives provide no such market incentive.

■ 5.2 HST Design Options

The analysis included five design options (in addition to the base HST Alternatives) that represent variations in HST alignment and/or station location. Specific features of the design options were described in Section 2.2.3. Each design option resulted in slight differences in population and employment growth and urbanized land area requirements at the county, regional, and statewide levels. However, all HST design options exhibit

county-level growth and land consumption effects that are of the same general magnitude as the primary system alternatives, and there are no meaningful differences in these results to distinguish between the design options.

Table 5.7 Year 2020 and 2035 Size of Urbanized Area (Acres)

Effects of Land Use Densification

County	Market Trends Scenario Urbanized Acreage		Land Use Densification Scenario			
			Urbanized Acreage		Comparison to Market Trends	
	2020	2035	2020	2035	2020	2035
Alameda	162,749	171,225	161,858	169,836	(890)	(1,389)
Contra Costa	157,675	164,874	157,675	164,874	–	–
San Francisco	27,039	28,345	27,039	28,307	–	(38)
San Mateo	78,223	81,267	76,937	79,517	(1,285)	(1,750)
Santa Clara	203,750	235,404	202,809	231,780	(941)	(3,624)
Solano	66,954	76,634	66,954	76,634	–	–
Bay Area*	696,389	757,749	693,272	750,948	(3,117)	(6,801)
Madera	35,354	45,329	35,354	45,329	–	–
Merced	45,055	57,212	45,011	57,157	(44)	(55)
Sacramento	181,049	202,471	180,246	200,448	(803)	(2,023)
San Joaquin	114,704	137,960	114,618	137,712	(86)	(248)
Stanislaus	69,612	93,562	69,543	93,240	(69)	(322)
Yolo	31,331	37,022	31,211	36,903	(119)	(119)
North Central Valley*	477,104	573,557	475,983	570,790	(1,121)	(2,767)
Fresno	139,346	189,503	139,300	189,039	(46)	(465)
Kern	173,910	226,851	173,320	225,631	(590)	(1,220)
Kings	37,100	44,910	37,100	44,910	–	–
Tulare	71,946	97,841	71,487	95,804	(459)	(2,037)
South Central Valley*	422,302	559,105	421,207	555,384	(1,095)	(3,721)
Los Angeles	806,720	881,982	804,075	876,134	(2,645)	(5,847)
Orange	315,270	323,189	313,719	319,333	(1,551)	(3,856)
Riverside	384,642	539,816	383,692	538,603	(950)	(1,213)
San Bernardino	367,724	498,004	367,542	497,567	(182)	(437)
San Diego	438,420	510,567	435,367	504,833	(3,053)	(5,734)
Southern California*	2,312,775	2,753,557	2,304,395	2,736,470	(8,380)	(17,087)
Influence Area Totals	**3,908,570**	**4,643,968**	**3,894,857**	**4,613,592**	**(13,713)**	**(30,377)**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table 5.8 summarizes the total acreage of land at urbanized densities needed to accommodate projected employment or population in 2020 for each design option. Table 5.9 summarizes the total acreage of urbanized land needed in 2035. Tables 5.10 and 5.11 show the difference in urbanized land area required for each design option relative to the base HST Alternative for 2020 and 2035, respectively.

Table 5.8 Year 2020 Size of Urbanized Area by Design Option
County and Regional Totals

County	Base	Palmdale	Diablo Direct	East Bay	Irvine	Outlying Stations
Alameda	162,749	162,568	162,707	163,125	162,714	162,749
Contra Costa	157,675	157,592	157,603	157,675	157,672	157,675
San Francisco	27,039	27,024	27,039	27,033	27,036	27,039
San Mateo	78,223	78,198	78,212	78,212	78,204	78,223
Santa Clara	203,750	203,533	203,342	203,752	203,701	203,750
Solano	66,954	66,924	66,953	66,954	66,945	66,954
Bay Area*	696,389	695,840	695,856	696,750	696,272	696,389
Madera	35,354	35,354	35,360	35,354	35,354	35,354
Merced	45,055	45,050	45,060	45,055	45,053	45,055
Sacramento	181,049	181,026	181,061	181,049	181,055	181,049
San Joaquin	114,704	114,777	114,721	114,704	114,697	114,704
Stanislaus	69,612	69,130	69,590	69,612	69,140	70,709
Yolo	31,331	31,327	31,331	31,331	31,331	31,331
North Central Valley*	477,104	476,664	477,123	477,104	476,631	478,201
Fresno	139,346	139,308	139,330	139,346	139,309	139,346
Kern	173,910	173,913	173,917	173,910	173,863	173,643
Kings	37,100	37,099	37,099	37,100	37,096	37,100
Tulare	71,946	71,919	71,946	71,946	71,943	71,873
South Central Valley*	422,302	422,239	422,293	422,302	422,211	421,962
Los Angeles	806,720	808,266	806,700	806,720	811,368	806,720
Orange	315,270	315,257	315,270	315,270	316,113	315,270
Riverside	384,642	384,607	384,635	384,642	384,611	384,642
San Bernardino	367,724	367,441	367,718	367,724	367,698	367,724
San Diego	438,420	438,292	438,385	438,420	438,281	447,074
Southern California*	2,312,775	2,313,863	2,312,707	2,312,775	2,318,072	2,321,430
Influence Area Totals	**3,908,570**	**3,908,606**	**3,907,979**	**3,908,931**	**3,913,186**	**3,917,981**

Source: Cambridge Systematics, Inc., 2003.
* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table 5.9 Year 2035 Size of Urbanized Area by Design Option
County and Regional Totals

County	Base	Palmdale	Diablo Direct	East Bay	Irvine	Outlying Stations
Alameda	171,225	171,015	171,239	171,658	171,232	171,225
Contra Costa	164,874	164,793	164,883	164,874	164,917	164,874
San Francisco	28,345	28,327	28,346	28,339	28,344	28,345
San Mateo	81,267	81,222	81,255	81,256	81,260	81,267
Santa Clara	235,404	234,392	234,510	235,405	235,504	235,404
Solano	76,634	76,535	76,640	76,634	76,682	76,634
Bay Area*	757,749	756,284	756,871	758,167	757,939	757,749
Madera	45,329	45,323	45,360	45,329	45,332	45,329
Merced	57,212	57,200	57,231	57,212	57,213	57,212
Sacramento	202,471	201,841	201,991	202,471	202,566	202,471
San Joaquin	137,960	138,196	138,003	137,960	137,960	137,960
Stanislaus	93,562	93,453	93,033	93,562	93,455	94,573
Yolo	37,022	37,009	37,022	37,022	37,030	37,022
North Central Valley*	573,557	573,023	572,640	573,557	573,556	574,568
Fresno	189,503	189,401	189,466	189,503	189,501	189,503
Kern	226,851	226,862	226,866	226,851	226,850	228,554
Kings	44,910	44,908	44,908	44,910	44,911	44,910
Tulare	97,841	96,714	97,840	97,841	97,841	96,311
South Central Valley*	559,105	557,885	559,080	559,105	559,103	559,278
Los Angeles	881,982	884,240	881,943	881,982	887,368	881,982
Orange	323,189	323,164	323,189	323,189	323,740	323,189
Riverside	539,816	539,742	539,805	539,816	539,795	539,816
San Bernardino	498,004	497,872	497,989	498,004	497,977	498,004
San Diego	510,567	509,666	510,519	510,567	510,415	522,073
Southern California*	2,753,557	2,754,683	2,753,444	2,753,557	2,759,295	2,765,064
Influence Area Totals	**4,643,968**	**4,641,876**	**4,642,035**	**4,644,386**	**4,649,894**	**4,656,659**

Source: Cambridge Systematics, Inc., 2003.
* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table 5.10 Year 2020 Size of Urbanized Area by Design Option

Difference from 2020 HST Base Alternative

County	Base	Palmdale	Diablo Direct	East Bay	Irvine	Outlying Stations
Alameda	–	(180)	(42)	376	(34)	–
Contra Costa	–	(83)	(72)	–	(3)	–
San Francisco	–	(15)	1	(6)	(3)	–
San Mateo	–	(25)	(11)	(11)	(19)	–
Santa Clara	–	(217)	(408)	1	(49)	–
Solano	–	(29)	(1)	–	(8)	–
Bay Area*	–	(549)	(533)	361	(117)	–
Madera	–	(0)	7	–	0	–
Merced	–	(5)	5	–	(2)	–
Sacramento	–	(23)	12	–	7	–
San Joaquin	–	73	17	–	(7)	–
Stanislaus	–	(482)	(22)	–	(472)	1,096
Yolo	–	(3)	0	–	1	–
North Central Valley*	–	(440)	19	–	(473)	1,096
Fresno	–	(38)	(16)	–	(37)	-
Kern	–	3	7	–	(47)	(267)
Kings	–	(0)	(0)	–	(3)	–
Tulare	–	(28)	(0)	–	(4)	(73)
South Central Valley*	–	(63)	(9)	–	(91)	(340)
Los Angeles	–	1,546	(20)	–	4,648	–
Orange	–	(12)	–	–	843	–
Riverside	–	(35)	(7)	–	(30)	–
San Bernardino	–	(283)	(6)	–	(26)	–
San Diego	–	(128)	(35)	–	(139)	8,655
Southern California*	–	1,088	(68)	–	5,297	8,655
Influence Area Totals	**–**	**36**	**(591)**	**361**	**4,616**	**9,411**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table 5.11 Year 2035 Size of Urbanized Area by Design Option

Difference from 2035 HST Base Alternative

County	Base	Palmdale	Diablo Direct	East Bay	Irvine	Outlying Stations
Alameda	–	(210)	14	433	8	–
Contra Costa	–	(82)	8	–	42	–
San Francisco	–	(18)	1	(6)	(1)	–
San Mateo	–	(45)	(12)	(11)	(7)	–
Santa Clara	–	(1,012)	(895)	1	100	–
Solano	–	(99)	6	–	48	–
Bay Area*	–	(1,465)	(878)	418	190	–
Madera	–	(6)	31	–	3	–
Merced	–	(12)	19	–	0	–
Sacramento	–	(630)	(480)	–	95	–
San Joaquin	–	235	42	–	(0)	–
Stanislaus	–	(109)	(529)	–	(106)	1,012
Yolo	–	(12)	0	–	8	–
North Central Valley*	–	(534)	(917)	–	(0)	1,012
Fresno	–	(102)	(37)	–	(2)	-
Kern	–	11	15	–	(1)	1,703
Kings	–	(2)	(2)	–	1	–
Tulare	–	(1,127)	(1)	–	(0)	(1,530)
South Central Valley*	–	(1,220)	(25)	–	(2)	172
Los Angeles	–	2,258	(39)	–	5,387	–
Orange	–	(25)	–	–	551	–
Riverside	–	(75)	(11)	–	(21)	–
San Bernardino	–	(131)	(15)	–	(27)	–
San Diego	–	(901)	(48)	–	(152)	11,507
Southern California*	–	1,126	(113)	–	5,738	11,507
Influence Area Totals	**–**	**(2,093)**	**(1,933)**	**418**	**5,925**	**12,691**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

At the statewide level, the results for all design options (except Outlying Stations) fall in a very narrow range compared to the base HST Alternative (approximately 8,000 acres in a statewide total of more than 4.6 million acres in 2035, or less than 0.2 percent). Due to the number of stations built at the edge of existing urbanized areas, the Outlying Stations design option can be associated with land consumption on a level closer to that of the Modal Alternative; however, changes for this design option are heavily influenced by results for San Diego County.

Palmdale Design Option

The Palmdale design option includes an additional station at Palmdale in the Antelope Valley of Los Angeles County. By adding a station at Palmdale, the primary effect of this design option is to increase projected urbanized land requirements in Los Angeles County by more than 2,250 acres (0.3 percent). Due to increased travel times involved with an Antelope Valley alignment, the Palmdale design option also slightly reduces requirements for urbanized land in nearly every study area county as a result of reduced population and employment growth. In total, the reductions in other counties outweigh the increase in Los Angeles County, resulting in a net decrease in statewide urbanized area of approximately 2,100 acres in 2035.

Although specific land consumption results were not generated at a subcounty level, the county-level results can be used to draw general inferences about the potential extent of growth in the Antelope Valley with this design option. As noted, this design option has decreased overall population and employment in Los Angeles County due to longer travel times. At the same time, it has slightly increased land consumption suggesting an increased amount of development in lower density areas (e.g., the Antelope Valley). The total year 2035 incremental growth (relative to the No-Project Alternative) in Los Angeles County is about 147,000 people and 90,000 jobs. If this incremental population and employment increase were to be spatially allocated in proportion to HST station boardings, the growth effect for the Antelope Valley with this design option would be on the order of 25,000 additional people and 15,000 additional jobs[5] relative to the No-Project Alternative.[6]

Diablo Direct Design Option

The Diablo Direct design option reduces travel time between the Central Valley, Sacramento, and the Bay Area by eliminating stops at Los Banos (Merced County) and Gilroy (Santa Clara County). This design option reduces the statewide total by approximately 600 acres in 2020 and 1,900 acres in 2035, compared to the base HST Alternative. Santa Clara, Sacramento, and Stanislaus Counties account for most of this reduction, although even in these cases the reduction is less than 0.5 percent of total projected urbanized acreage. The reduction in these counties is likely tied to elimination of direct or connecting access in southern Santa Clara, San Benito, and Monterrey Counties with this design option.

---

[5] This value was derived by allocating population and employment growth to sub-county areas in proportion to total HST boardings and alightings at stations within each sub-county.

[6] Using a similar methodology, the base HST Alternative would have a year 2035 incremental growth effect of about 22,000 people and 14,000 jobs in the Sylmar and Santa Clarita areas due to an HST station at Sylmar. Some or all of this incremental growth may occur within the Antelope Valley along SR 14.

Although this design option represents a faster connection between the Bay Area and Northern Central Valley, this improved travel time does not translate into higher population and employment growth in the affected counties as might be expected. The likely reason for this result is that the base HST Alternative represents a large improvement in accessibility and travel efficiency for these counties over the other system alternatives, with the Diablo Direct design option providing a very marginal additional influence *in terms of growth inducement potential*. Therefore, the growth effects for these counties manifest primarily in the base HST Alternative rather than this design option.

East Bay Design Option

The East Bay design option adds three stations between Oakland and San Jose on a branch line through Alameda County. The primary effect of this design option is to increase the urbanized land area required in Alameda County by approximately 400 acres in both 2020 and 2035. This is projected to occur as a result of increased population and employment reacting to improved access between the East Bay and other parts of the State. This growth offsets increased densification around the three stations in Alameda County. There are no projected urbanization effects in other parts of the State under this design option.

Irvine Design Option

The Irvine design option increases the statewide total by approximately 4,600 acres in 2020 and 5,900 acres in 2035, compared to the base HST Alternative. Outside of Southern California, this design option is projected to increase urbanization by about 200 acres. Increased population and employment taking advantage of the improved access between southern Los Angeles County and Orange County increases the land consumption requirements of these areas. The design option is projected to increase land requirements in Los Angeles County by approximately 4,600 acres in 2020 and 5,400 acres in 2035 compared to the base HST Alternative. In Orange County, projected urbanized land increases by about 800 acres in 2020 and about 500 acres in 2035. This decline for Orange County (from 2020 to 2035) reflects the effects of increased densification following introduction of HST service, although the effect is not strong enough to outweigh total population and employment growth.

Outlying Stations Design Option

The Outlying Stations design option is projected to increase statewide urbanized area by approximately 9,400 acres in 2020 and 12,700 acres in 2035 compared to the HST Base design option. Moving station sites out of the downtown areas generally increases the requirements for urbanized land in the affected counties by limiting the ability of the HST system to promote downtown redevelopment at higher densities and/or by creating new development at the edge of the community around the station. This effect is most pronounced in San Diego County, where moving the terminal site from Downtown San Diego to East Mission Valley is projected to increase the size of the urbanized area by about 11,500 acres (over two percent) in 2035. Stanislaus and Kern Counties are also

projected to experience growth in urbanized area size by over 1,000 acres in 2035 with HST stations outside of the downtown area.

Tulare County exhibits a decrease in land consumption under this design option. This result likely occurs because the existing downtown areas are developed to an extent equal to the selected density gradient; therefore, under the adopted methodology these downtowns cannot absorb much additional growth with the introduction of HST. An alternative station site in these communities would essentially allow development of a "second downtown" that, although located in a suburban or currently undeveloped setting, could develop at a higher marginal density and absorb growth that would otherwise spread to adjacent lower density areas.

5.3 Regional and County Growth Effects

Each of the system alternatives has varied effects on different parts of the State. This section describes how population and employment growth is projected to influence the need for urbanized land in various regions and counties.

5.3.1 San Francisco Bay Area

Under the No-Project Alternative, the Bay Area is projected to experience an increase in urbanized land area of approximately 76,000 acres between now and 2020 and a further 57,800 acres between 2020 and 2035. This represents a change of 12.3 percent by 2020 and 21.7 percent by 2035 from its current urbanized area of approximately 616,500 acres. Solano County is projected to encounter the largest percent change, adding more than 12,500 acres to its current urbanized area of approximately 53,800 acres by 2020 and an additional 8,800 acres between 2020 and 2035. This represents an increase from current conditions of 23.3 percent by 2020 and 39.7 percent by 2035.

The Modal Alternative is projected to increase urbanized land area over the No-Project Alternative by approximately 1,900 acres (0.28 percent) in 2020 and approximately 4,200 acres (0.56 percent) in 2035. The largest percent increase is projected to occur in Solano County, where an increase of nearly 700 acres (0.89 percent) is expected in 2035. Other areas experiencing relatively large percent changes under the Modal Alternatives in 2035 include San Mateo County (0.62 percent) and San Francisco County (0.57 percent).

The HST Alternative is projected to increase Bay Area urbanized land area over the No-Project Alternative by approximately 3,900 acres (0.56 percent) in 2020 and approximately 7,500 acres (1.0 percent) in 2035. The largest percent increase is projected to occur in Solano County, where an increase of approximately 1,500 acres (2.0 percent) is expected in 2035. Santa Clara County, with its large current urbanized area, is projected to experience the largest absolute increase of more than 3,200 acres over the No-Project Alternative in 2035.

Results from the HST sensitivity test suggest that the land use densification scenario would have the largest effects in Santa Clara, San Mateo, and Alameda Counties, with a potential reduction in land consumption needs of about 6,800 acres compared to the Market Trends scenario.

5.3.2 Northern Central Valley

Under the No-Project Alternative, the Northern Central Valley is projected to experience an increase in urbanized land area of approximately 114,000 acres between now and 2020; and a further 96,000 acres between 2020 and 2035. This represents an increase of 31 percent by 2020 and 57 percent by 2035. Fueled by very strong population and employment growth, Madera and San Joaquin Counties are projected to encounter the largest percent changes, approximately doubling their respective current urbanized areas of approximately 23,300 acres and 74,300 acres by 2035.

The Modal Alternative is projected to increase urbanized land area over the No-Project Alternative by approximately 1,200 acres (0.26 percent) in 2020 and approximately 4,500 acres (0.79 percent) in 2035. The largest percent increase is projected to occur in San Joaquin County, where an increase of more than 2,000 acres (1.5 percent) is expected in 2035; Stanislaus County is also expected to experience a change in excess of one percent.

The results for the Modal Alternative are a stark contrast to results for the HST Alternative. The HST Alternative is projected to reduce urbanized land area compared to the No-Project Alternative by approximately 5,200 acres (1.1 percent) in 2020 and approximately 4,700 acres (0.79 percent) in 2035. The largest percent decreases (all more than three percent relative to the No-Project) are projected to occur in Stanislaus, Madera, and San Joaquin Counties, where a combined total reduction in urbanized land area of more than 9,700 acres is expected in 2035. These reductions are offset somewhat by increases in Sacramento County and Merced County.

Results from the HST sensitivity test suggest that the land use densification scenario would have the largest effect in Sacramento County (about 2,000 acres, or one percent, decrease in size of urbanized area). Smaller effects would be felt in Stanislaus, San Joaquin, and Yolo Counties.

5.3.3 Southern Central Valley

Under the No-Project Alternative, the Southern Central Valley is projected to experience an increase in urbanized land area of approximately 127,800 acres between now and 2020 and a further 135,200 acres between 2020 and 2035. This represents an increase of 45 percent by 2020 and 92 percent by 2035. Tulare, Fresno, and Kern Counties are projected to encounter percent changes above the regional average in 2020 and 2035.

The Modal Alternative is projected to increase urbanized land area over the No-Project Alternative by approximately 1,900 acres (0.45 percent) in 2020 and 4,300 acres

(0.78 percent) in 2035. Fresno County is projected to encounter the largest percent increase, with approximately 1,500 acres (1.1 percent) more land consumed by the Modal Alternatives than the No-Project by 2020 and 2,700 acres (1.5 percent) by 2035.

The HST Alternative is projected to increase urbanized land area over the No-Project Alternative by approximately 7,900 acres (1.9 percent) in 2020 and approximately 9,500 acres (1.7 percent) in 2035. Kings and Kern Counties are projected to experience the largest percent increases, where increases of approximately 1,300 acres (3.1 percent) and 5,800 acres (2.6 percent) are expected in 2035, respectively.

More aggressive regulatory policies and development incentives that encourage denser, accelerated development in station areas are projected to have the most significant effects in Kern and Tulare Counties. In 2035 in Kern County, the 2035 HST land use densification scenario reduces an increase in urbanized area of approximately 5,800 acres under the Market Trends scenario to approximately 4,600 acres. In Tulare County, the same scenario amplifies a reduction of approximately 200 acres under the Market Trends scenario to a reduction of more than 2,200 acres.

5.3.4 Southern California

Because of the much larger current urbanized area in Southern California (nearly three times the size of the Bay Area at approximately 1,871,000 acres), this region is projected to experience the greatest magnitude of changes under each system alternative.

Under the No-Project Alternative, Southern California is projected to experience an increase in urbanized land area of approximately 458,700 acres between now and 2020 and a further 438,700 acres between 2020 and 2035. This represents a change of 25 percent by 2020 and 48 percent by 2035. San Bernardino and Riverside Counties are projected to encounter the largest percent changes (each more than doubling). They are projected to add more than 250,000 acres each to their current urbanized areas by 2035.

The Modal Alternatives is projected to increase urbanized land area over the No-Project Alternative by approximately 8,500 acres (0.36 percent) in 2020 and approximately 52,400 acres (1.9 percent) in 2035. The largest percent increase is projected to occur in Riverside County, where an increase of approximately 33,000 acres (6.4 percent) is expected in 2035.

The HST Alternative is projected to reduce urbanized land area from the No-Project Alternative by approximately 17,000 acres (0.73 percent) in 2020 as densification around rail stations in Los Angeles, Riverside, and Orange Counties occurs. By 2035, population and employment growth slightly reduce the densification effects and urbanized land area declines by approximately 14,900 acres (0.54 percent) from the No-Project Alternative. In 2035, urban functions are projected to require 35,000 acres less area in Los Angeles County under the HST Alternative than under the No-Project Alternative, as densification around stations and accessibility to other parts of the State reduce demand for non-urbanized land. Approximately two-thirds of this effect is offset by increased land requirements in Riverside County, reflecting a strong migration trend influenced by high-speed train.

More aggressive regulatory policies and development incentives that encourage denser, accelerated development in station areas are projected to have the most significant effects in Los Angeles County and San Diego County. In Los Angeles County, the HST land use densification scenario amplified a reduction in projected urbanized land area of nearly 35,000 acres by 5,800 acres (17 percent). In 2035, the HST land use densification scenario reverses a relatively small increase in urbanized area under the Market Trends scenario in San Diego County to a decrease of approximately 5,700 acres compared to the No-Project Alternative.

5.4 Key Findings

Overall, the system alternatives and HST design options represent very similar levels of growth effects in terms of urbanized area size and land consumption needs. The incremental effect of the Modal and HST Alternatives relative to the No-Project Alternative is very small when compared to the incremental effect of the No-Project Alternative relative to 2002 existing conditions.

Analysis of results for individual counties largely follows these general statewide results. Nonetheless, the HST Alternative does create some larger incremental growth relative to the other system alternatives in some Central Valley counties between Sacramento and Fresno. However, in all cases except Sacramento County, the incremental employment effect is much larger than the incremental population effect, suggesting that the HST Alternative has a stronger influence in distributing employment throughout the State. Also, this result suggests that HST will not lead to wholesale shifts in residential location from the Bay Area and Los Angeles into the Central Valley.

One of the most telling summary statistics is to combine population and employment growth projections with land consumption forecasts, providing a measure of "land consumed per new job and resident". Essentially, this metric tells us how "efficient" each alternative is at accommodating the projected growth; since the system alternatives have very similar levels of overall growth, the efficiency by which that growth is accommodated becomes very important. Table 5.12 provides the relevant data and resulting metric for each of the system alternatives; lower values of the metric suggest greater efficiency. The results indicate that the HST Alternative is the most "efficient" of the system alternatives, providing an incremental development density that is 4.0 percent more "efficient" (i.e., less land per new job and resident) than the No-Project Alternative, while the Modal Alternative is 2.3 percent less efficient (i.e., more land per new job and resident) than the No-Project Alternative. This efficiency for the HST Alternative is achieved in conjunction with the highest population and employment growth rates of all system alternatives.

Table 5.12 Marginal Land Consumption

	No-Project Alternative	Modal Alternative	HST Alternative
Land Consumption (thousands of acres)	1,505	1,570	1,501
Job Growth (000)	9,085	9,328	9,529
Population Growth (000)	19,408	19,771	20,099
Acres Consumed per New Job and Resident	0.0528	0.0540	0.0507
"Efficiency Gain" Relative to No-Project Alternative	-	-2.3%	+4.0%

Source: Cambridge Systematics, Inc., 2003.

6.0 Preparers

6.0 Preparers

The following individuals participated in the analysis of statewide, regional, local and station area growth effects.

Christopher Wornum, Cambridge Systematics, Inc.

Project Role: Principal-in-Charge for consultant team; task leader for estimation of industry-specific benefits of HST and forecast of benefits across HST counties; and task leader for the station area impacts of induced growth.

Education: B.S., Political Economics from the University of California, Berkeley; M.S. in Management Science from Sloan School of Management, Massachusetts Institute of Technology (MIT); M.S. in Urban and Regional Planning from MIT.

Experience: Twenty-one years in transportation analysis, planning, and private sector strategy planning and economic analysis, with emphasis on economic impacts of transportation; specialization in public facility finance, feasibility analysis, economic development, market research, and integration of transportation and land use; eight years experience in the application of the REMI model to transportation investments.

George D. Mazur, P.E., Cambridge Systematics, Inc.

Project Role: Project Manager; development of analysis methodologies; lead author of technical reports; processing of travel demand output for use in economic growth models; estimation of non-user benefits.

Education: B.S. in Civil Engineering from Purdue University; M.S. in Transportation Engineering from University of California, Berkeley.

Experience: Twelve years experience in transportation planning and policy, travel demand forecasting, and environmental analysis; registered Professional Engineer in Georgia and California.

J. Christopher Kopp, AICP, Cambridge Systematics, Inc.

Project Role: Task leader for international and domestic research into development experience around HST stations; task leader for development of employment land consumption analysis.

Education: B.S. in Architecture from the University of Cincinnati; M.S. in Civil Engineering from Northwestern University.

Experience: Eight years in transportation system analysis and planning, with emphasis on passenger surface transportation. Specialization in passenger facility concept design, feasibility analysis, and integration with surrounding urban context.

Dan Hodge Cambridge Systematics, Inc.

Project Role: Helped develop economic analysis methodologies; task manager and quality control for REMI modeling and post-processing; processed data for the no-build forecasts, business attraction inputs, and allocated employment impacts by industry to counties; report preparation.

Education: A.B. in Economics/Business from Lafayette College; M.A. in Applied Economics and M.P.P. in Public Policy from the University of Michigan.

Experience: Eight years experience performing economic impact analyses and working with the REMI model; over three years experience focused on evaluating the relationships between transportation and economic development; member of the TRB committee on Transportation and Economic Development.

Hugh Louch, Cambridge Systematics, Inc.

Project Role: Researched and developed population and employment projections.; generated monetized benefits for HST and Modal scenarios; performed analysis of benefits using REMI software.

Education: B.A. in Sociology from the University of California, Santa Barbara; M.A. in Sociology from Princeton University.

Experience: Six years in planning and policy research, and statistical analysis.

Aimee Chong, Cambridge Systematics, Inc.

Project Role: Data analyst for development of employment land consumption analysis.

Education: B.S. in from the University of Illinois, Champaign-Urbana; M.S. in Civil Engineering from University of California, Berkeley.

Experience: Two years in transportation system analysis and planning, with emphasis on environmental and land use impact.

Jacob Meunier Cambridge Systematics, Inc.

Project Role: Researching development around high-speed rail stations in Europe and Japan.

Education: B.A. in French from Pomona College; Diplome d'Etudes Superieures in International Relations from the Graduate Institute of International Studies (University of

Geneva); Ph.D. in Comparative History from Brandeis University (Dissertation: *The Politics of High-Speed Rail in France, 1944-1983*).

Experience: Two years in transportation planning and policy at Cambridge Systematics; author of *On the Fast Track: French Railway Modernization and the Origins of the TGV*, Westport, Connecticut, Greenwood Publishers, 2002.

Glen Weisbrod, Economic Development Research Group, Inc.

Project Role: Design and initial construction of the economic growth model to forecast county level business and population attraction impacts; technical reviewer for REMI model forecasts.

Education: B.A. in Economics from Brandeis University; M.S. in Civil Engineering (Transportation) from Massachusetts Institute of Technology; M.C.P. in City Planning from Massachusetts Institute of Technology.

Experience: Twenty-six years experience in consulting relating to economic development, economic impact modeling, and transportation; 15 years experience in the application of the REMI model to transportation investments; Chair of the Committee on Transportation and Economic Development – Transportation Research Board; current President of Economic Development Research Group.

Teresa Lynch, Economic Development Research Group, Inc.

Project Role: Construction and analysis applying the economic growth model to forecast county level business and population attraction impacts.

Education: B.A. in Economics and Public Policy from the University of North Carolina-Chapel Hill; M.A. in Regional Science from the University of Pennsylvania.

Experience: Fourteen years experience in consulting and university research relating to transportation, the environment, and urban and regional economic development; six years working as a consultant to EPA's Office of Research and Development.

Michael Reilly, University of California at Berkeley

Project Role: Technical lead for development of residential land consumption; modified and ran CURBA model.

Education: B.A. in Anthropology from University of California; M.C.P from the University of California; Ph.D. program in Urban and Regional Planning at University of California, in progress.

Experience: Six years research experience in urban and transportation analysis and modeling, with focus on California land use and development patterns. Six years research in developing and applying CURBA model.

7.0 Sources of Data/Information

7.0 Sources of Data/Information

The following external individuals or agencies were contacted as part of this project to obtain information of potential relevance to the work. The following list provides the name, agency, and location (city and state or country) of the individual that was contacted, as well as a brief overview of the topics discussed.

- Morioka Prefecture Office; Morioka, Japan; Growth impacts of Shinkansen on Morioka.
- Morioka City Office; Morioka, Japan; Growth impacts of Shinkansen on Morioka.
- Akita Prefecture Office; Akita, Japan; Growth impacts of Shinkansen on Akita.
- Akita City Office; Akita, Japan; Growth impacts of Shinkansen on Akita.
- Hachinohe City Office, Local Planning Agency; Hachinohe, Japan; Growth impacts of Shinkansen on Hachinohe.
- Omagari City Office, Transportation Agency; Omagari, Japan; Growth impacts of Shinkansen on Omagari.
- Shinjyo City Office, Local Planning Agency; Shinjyo, Japan; Growth impacts of Shinkansen on Shinjyo.
- Nagano Prefecture Office, Transportation Policy Agency; Nagano, Japan; Local and regional growth effects from Shinkansen system.
- Saku City Office, Local Planning Agency; Saku, Japan; Growth impacts of Shinkansen on Saku, and nature of development with new greenfield station.
- M. Nerie; Société CITADIS; Avignon, France; Growth impacts of TGV on Avignon, and nature of development with new greenfield station.
- M. Mertens; Sevice public féderal mobilité et transports; Brussels, Belgium; Growth impact of Thalys service in Brussels and surrounding area.
- Hugues Duchateau; STRATEC; Brussels, Belgium; Growth impact of Thalys service in Brussels and surrounding area.
- Christine Roy; Chambre de Commerce et d'Industrie a Chalon sur Saone; Le Creusot, France; Growth impacts of TGV on Le Creusot.

- Cathérine Méan; Chambre de Commerce et d'Industrie de Geneve; Geneva (CH); Growth impacts of TGV on Geneva.

- Francoise de Varenne; Chambre de Commerce et d'Industrie de Lille Metropole; Lille, France; Growth impacts of TGV on Lille.

- Dominique Mignot; Laboratoire d'Economie des Transports (LET); Lyon, France; Economic development and job creation impacts of TGV within Lyon.

- Laurent Manson; Chambre de Commerce et d'Industrie de Macon; Macon, France; Growth impacts of TGV on Macon.

- Jean-Paul Couasnon; Agence de Développement Economique du Mans (ADEMA); Le Mans, France; Growth impacts of TGV on Le Mans.

- Sylvie Adham; Euroméditerranée; Marseille, France; Growth impacts of TGV on Marseille, especially in relation to Euroméditerranée, Marseille's newest development project that is partly inspired by the recent extension of the TGV to Marseille.

- Mme. Hubert; Chambre de Commerce et d'Industrie de Nantes et de Saint-Nazaire; Nantes, France; Growth impacts of TGV on Nantes.

- Dominique Royoux; Mairie; Poitiers, France; Growth impacts of TGV on Poitiers.

- Mme. Grasse; Chambre de Commerce et d'Industrie de la Drome; Valence, France; Growth impacts of TGV on Valence.

- Patricia Franco; Camara de Comercio e Industria de Camino Real; Ciudad Real, Spain; Commercial development impact of AVE in Ciudad Real.

- Patricia Franco; Camara de Comercio e Industria de Camino Real; Puertollano, Spain; Commercial development impact of AVE in Puertollano.

- Shawn Holyoke; City of Dallas; Dallas, TX; Dallas station development.

- Tony Gambilonghi; Middlesex County; New Brunswick, NJ; Metropark station development.

- Paul de Maio; City of Alexandria; Alexandria, VA; Alexandria station development.

- Sam Surtees; West Windsor Township; West Windsor, NJ; Princeton Junction station development.

- Karyn Gilvarg; City of New Haven; New Haven, CT; New Haven station development.

- Eric Foster; Maryland-National Capital Parks & Planning Commission; Upper Marlboro, MD; New Carrollton station development.

- Jane McVey; City of Oceanside; Oceanside, CA; Oceanside station development.
- Gerald Gilbert; City of Oceanside; Oceanside, CA; Oceanside station development.
- Pat Colombe; City of San Jose; San Jose, CA; San Jose station development.
- Craig Sullivan; North American Title Company; Long Beach, CA; Availability of time-series data on commercial development patterns and developable land in California.
- Stephen Levy; Center for the Continuing Study of the California Economy; Palo Alto, CA; County-level employment forecasts for California.

Appendix A

Transportation Demand and Levels of Service for the Modal Alternative

Appendix A. Transportation Demand and Levels of Service for the Modal Alternative

The analysis of economic growth effects relies, in part, upon projected differences in travel demand, travel time, and travel cost characteristics between the system alternatives and design options. The travel demand, time, and cost information for all alternatives was derived either directly or indirectly from the HSRA's intercity travel demand model. Since it was not feasible to test the Modal Alternative with the HSRA's model, an indirect method was used to develop reasonable estimates of travel demand, time, and cost for the Modal Alternative based on similar information for the other alternatives. This appendix describes the methods that were used to develop these estimates based on travel model results that represented two system scenarios:

1. **Sensitivity Test 1.** This scenario directly corresponded to Sensitivity Analysis #1 as described in the Business Plan.[1] It included increased air and auto growth rates combined as well as network, travel time and cost attributes that represent the "business plan" assumptions (i.e., original travel times and air fares) of the HST Alternative.

2. **Sensitivity Test 1/No-Project.** This scenario included the increased air and auto growth rates from Sensitivity Analysis #1, combined with network, travel time, and cost attributes from the Business Plan that represent the No-Project Alternative.

A.1 Transportation Demand

The Modal Alternative has been defined as a system of improvements to serve the full representative intercity demand. This representative demand was derived from the high-end sensitivity analysis completed for a year 2020 high-speed train system and is based on the independent ridership and revenue forecasts prepared for the HSRA[2]. The Modal and HST Alternatives are assumed to serve equal levels of travel demand (summed across all

[1] California High Speed Rail Authority, *Final Business Plan*, June 2000, pp 29-30.

[2] "Independent Ridership and Passenger Revenue Projections for High-Speed Rail Alternatives in California, Draft Final Report, January 2000," prepared for the California High-Speed Rail Authority by Charles River Associates.

modes). For this analysis, the Modal and HST demand (summed across all modes) is assumed to equal the No-Project demand PLUS induced trips.

The adopted methodology used demand results from both system scenarios mentioned above. In summary, for each county to county pair (i-j), total demand under the Modal Alternative was set equal to the total No-Project demand (from Sensitivity Test 1/No-Project) plus trips that were induced to HST (as derived from a comparison of Sensitivity Test 1 to Sensitivity Test 1/No-Project). Induced demand was allocated to auto and air modes for the Modal Alternative based on the proportion of No-Project demand in those two modes for the county pair i-j. Conventional rail demand for the Modal Alternative was set equal to the No-Project demand (from Sensitivity Test 1/No-Project).

The mathematical representation of this methodology is as follows:

Let:

i = County 1

j = County 2

DA = Travel demand for auto mode

DF = Travel demand for air mode

DR = Travel demand for conventional rail mode

DT = Travel demand for all modes

N = Sensitivity Test 1/No-Project (i.e., no HST network)

M = Modal Alternative

S = Sensitivity Test 1 (i.e., with HST Network)

Then:

Conventional Rail Demand

$$DR_{Mij} = DR_{Nij}$$

Auto Demand

$$DA_{Mij} = DA_{Nij} + \left[\left(\frac{DA_{Nij}}{DA_{Nij} + DF_{Nij}} \right) * \left(DT_{Sij} - DT_{Nij} \right) \right]$$

Aviation Demand

$$DF_{Mij} = DF_{Nij} + \left[\left(\frac{DF_{Nij}}{DA_{Nij} + DF_{Nij}} \right) * \left(DT_{Sij} - DT_{Nij} \right) \right]$$

As an example of this methodology, suppose that model results show the following demand for a particular county-to-county pair from the two runs of Sensitivity Analysis 1:

Modal Demand Forecasts	Sensitivity Test 1 (HST Network)	Sensitivity Test 1/No-Project (No-Project Network)
Aviation	10	100
Automobile	405	500
Conventional Rail	5	10
High Speed Train	200	n/a
Total	620	610

A comparison of these results shows that the HST service induces 10 new trips (620 trips minus 610 trips), with the remaining 190 HST trips diverted from the other modes. Given these results, the demand estimate for the Modal Alternative would be as follows:

Conventional Rail Demand

$$DR_{Mij} = DR_{Nij} = 10$$

Auto Demand

$$DA_{Mij} = 500 + \left[\left(\frac{500}{100 + 500} \right) * (620 - 610) \right] = 508$$

Aviation Demand

$$DF_{Mij} = 100 + \left[\left(\frac{100}{500 + 100} \right) * (620 - 610) \right] = 102$$

A.2 Transportation Service Levels

Aviation Mode

For air fares, the Modal Alternative was assumed to follow the Business Plan air fare assumptions that were developed for the base forecast. This resulted in air fares being equal between the Modal and No-Project Alternatives, with airfares for the HST Alternative increased by 150 percent over these values.

For in-air travel times, the Modal Alternative was assumed to follow the Business Plan air travel time assumptions from Sensitivity Test 2, which involved a travel time increase of 15 minutes for flights to, from, or through San Diego, Los Angeles International, or San

Francisco International airports. (This assumption was also adopted for the other alternatives in this analysis.)

For out-of-vehicle travel (OVT) time (i.e., wait time, terminal processing, etc.), the Modal Alternative was assumed to achieve a time savings over the values used for the Business Plan base forecast. Specifically, OVT times were decreased by 30 minutes for trips to and from the San Joaquin Valley, and 15 minutes for all other locations. These time reductions represent an assumed increase in flight frequencies that could be accommodated with the airport improvements that are included with the Modal Alternative; the assumed increased flight frequencies would reduce the wait time component of OVT, with a larger proportional reduction in the San Joaquin Valley due to limited non-stop flight frequencies in the base forecast. (The other alternatives used OVT times from the Business Plan base forecast for this analysis.)

For access/egress times to and from airports, the Modal Alternative was assumed to follow the Business Plan assumptions that were developed for the base forecast. (This assumption was also adopted for the other alternatives in this analysis.)

Conventional Rail Mode

Rail fares, in-vehicle travel times, OVT times, and access/egress times for the Modal Alternative were assumed to follow the Business Plan assumptions that were developed for the base forecast. (This assumption was also adopted for the other alternatives in this analysis.)

Automobile Mode

Auto Travel Costs

Auto travel costs (i.e., operating costs, fuel, and parking) for the Modal Alternative were assumed to follow the Business Plan assumptions that were developed for the base forecast. (This assumption was also adopted for the other alternatives in this analysis.)

Auto Travel Times

The Modal Alternative includes highway improvements that would provide increased capacity in many corridors for the representative intercity demand. Given this project's assumption of a fixed trip table,[3] the capacity increases could lead to improvements in

[3] It is recognized that considerable debate exists as to the potential of highway capacity improvements to induce further highway travel. This induced travel may, in turn, reduce the travel time benefit that a highway capacity improvement could provide under assumptions of a fixed level of travel demand. Nonetheless, the fixed travel demand (i.e., fixed trip tables)

(Footnote continued on next page...)